

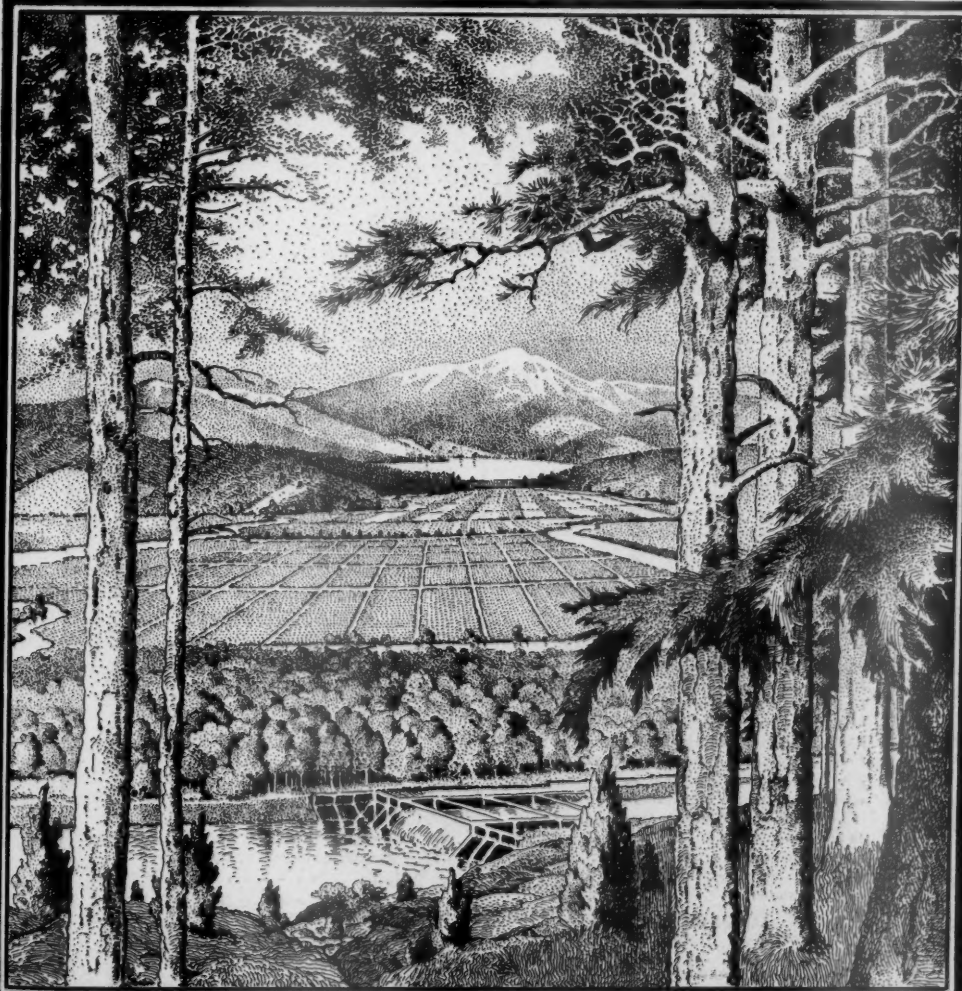
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Vol. IX—No. 6

JUNE, 1903

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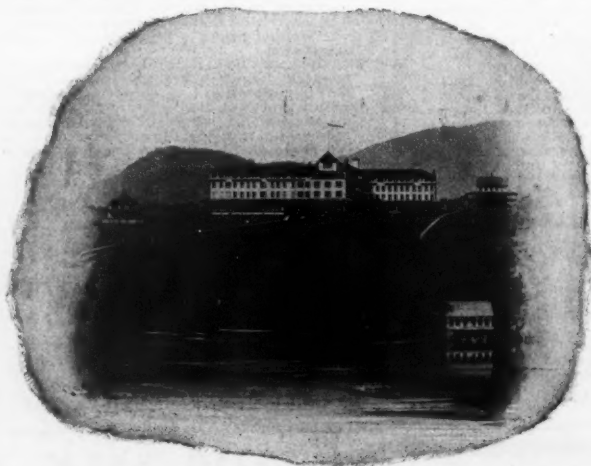
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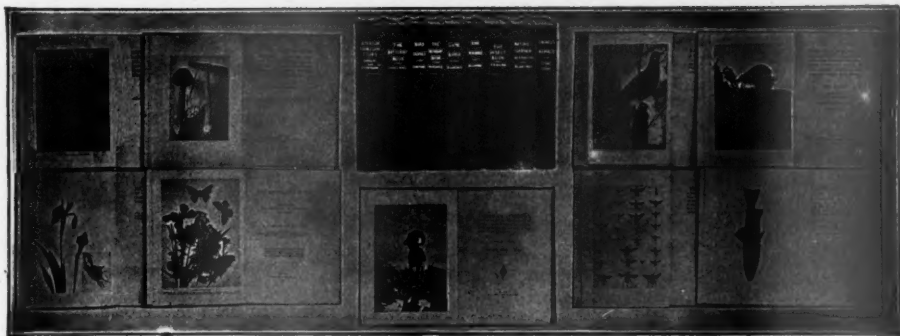
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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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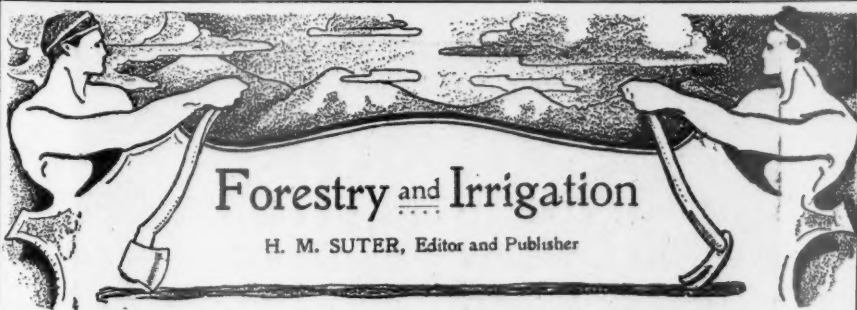
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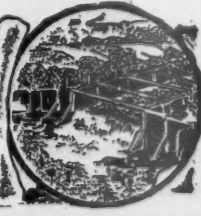
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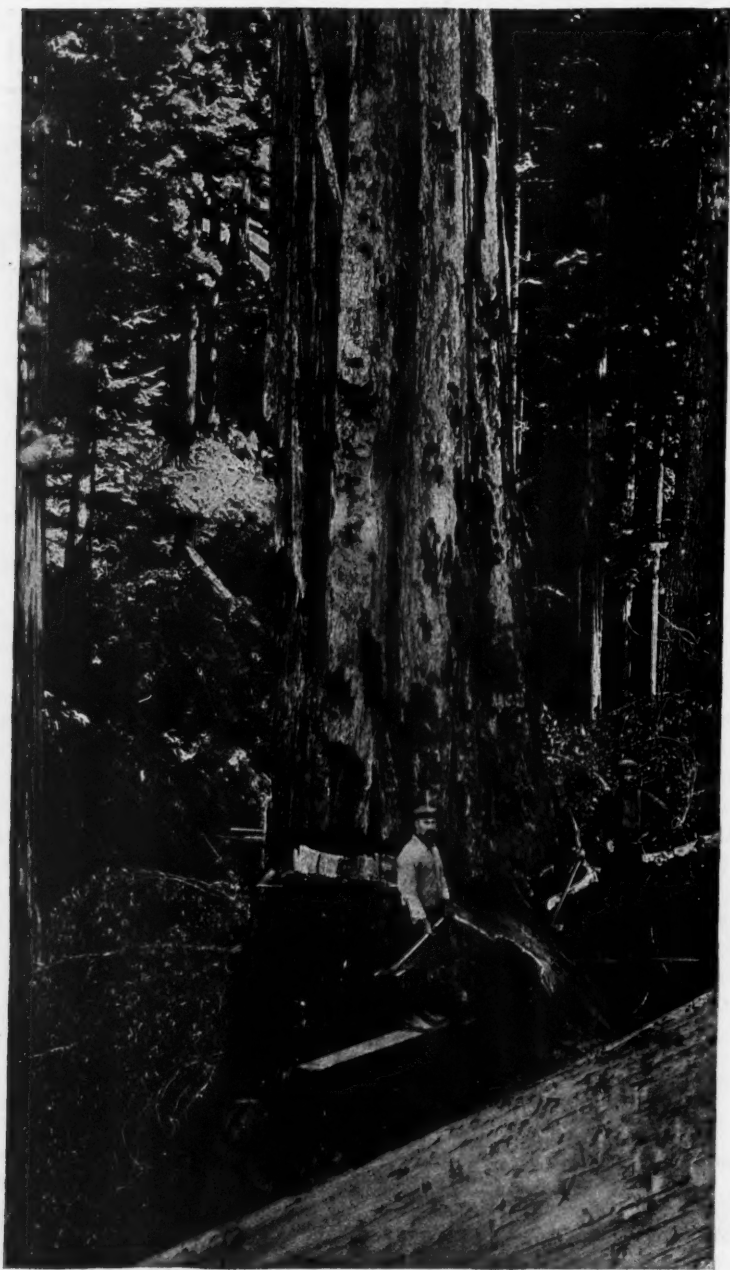
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Forestry and Irrigation.

VOL. IX.

JUNE, 1903.

No. 6.

NEWS AND NOTES.

Forest Work Outlined in Minnesota.

Mr. Gifford Pinchot, Forester of the Department of Agriculture, has just returned to Washington from a trip to northern Minnesota, where he made a tour of the Cass and Leech Lake region. In company with Commissioner Richards, of the General Land Office, he inspected the work carried on during the past summer and winter under the direction of Mr. Eugene S. Bruce, Lumberman in the Bureau of Forestry. The principal object of this work was to select, in accordance with the provisions of the Morris act, passed at the first session of the last Congress, a tract of 225,000 acres for a forest reserve, about the headwaters of the Mississippi. In addition, ten sections of land were to be chosen, to remain unlogged in the interest of the permanent beauty of the region.

On the 225,000 acres to be chosen for a forest reserve from the Chippewa Indian lands, now to be opened, the law provides that 95 per cent of the timber shall be removed under rules and regulations prescribed by the Forester, one of the objects of whose recent trip was to determine on the manner of selecting the five per cent to remain and the rules to be employed. It was found that excellent work had been done by the members of the Bureau, and that the situation, both on the ground and in the public sentiment of the state, was most favorable to the proposed reserve. Reproduction of the forest is abundant and easily secured if fires can be kept out. In fact, the fire problem is the greatest one to be faced. In order to meet it in part, the bill provides for the burning of tops and other debris of the

logging at a time when there will be no danger that the fire will spread.

At a dinner in St. Paul, arranged in honor of Mr. Pinchot by the Minnesota Club, Governor Van Sant and other prominent men in the state who are interested in forestry were present. Among the addresses was one by Mr. Fred G. Weyerhaeuser, a prominent lumberman of Minnesota, who said that the lumberman had come to see the practical importance of forestry in his operations. Brief addresses were made by Senator Clapp, Representative F. C. Stevens, Professor Tucker, and Mr. F. M. Eddy.

The list of guests at this banquet, in addition to the Governor, included State Auditor S. G. Iverson, who, by virtue of his office, is state forest commissioner; Gen. C. C. Andrews, state fire warden; Professors S. B. Green and F. D. Tucker, of the state agricultural school; Herman Chapman, superintendent of the experiment station at Grand Rapids; Mayor F. M. Kratka, of Thief River Falls; Gen. W. A. Kobbe, D. R. Noyes, who was Mr. Pinchot's host in St. Paul; Ambrose Tighe, B. F. Beardsley, Chas. Christodoro, Webster Wheelock, R. C. Jefferson, W. B. Dean, Winthrop Noyes, and Conde Hamlin.

Spring Drouth in the East.

Many owners of truck farms and market gardens in the Middle Atlantic States have had it forcibly brought home to them during the month of May that great loss is bound to accrue to them through protracted dry weather during the most important part of the growing season. On the one hand, those with-

out irrigation plants of some sort are confronted by serious losses, particularly in the early vegetable and strawberry crops. On the other hand, farmers who have some means of applying water to their crops are doubly jubilant, because the warm sunshine, in connection with water, has made sturdy growth, and also because the general drouth conditions have made good produce scarce and high-priced. In Washington, situated in the center of an immense market gardening area, which was not visited by rain between May 4 and May 22, it is a noteworthy fact that the strawberries in market are distinctly of two classes: those grown under conditions which left everything to natural sources and those which have resulted from care and the application of needed water. The former are undersized and unattractive; the latter large and of fine color and appearance, and the difference in the price obtained for the two qualities is quite as marked as the difference in looks and flavor.

These things go to prove that irrigation for the eastern farmer is not in any sense a fad, but is well within the realm of hard, practical fact if the grower wants to make sure of good profit on intensive crops.

President Roosevelt Interested in Forestry and Irrigation.

A record of the speeches of the President on his western tour would show many apt allusions to the conservation of the woods and waters of the country through which he has passed. From the beginning of his tour he has constantly called the attention of his audiences to the need of conserving their country's resources through a wise forest policy, and the development of them by the preservation and use of water supplies. It is noteworthy that he has never lost an opportunity during this time to speak at educational institutions, and in California particularly he made a series of addresses at the collegiate institutions of the state, including Pomona College at Los Angeles, the University of the Pacific at San José, Santa Clara College

at Santa Clara, Stanford University at Palo Alto, and culminating in a commencement address at the University of California at Berkeley. In all of these he showed that he was quick to observe and appreciate the resources of California, and he urged on his hearers the necessity of working toward the fullest realization of the bounties that a generous nature had bestowed by making the most of them and their perpetuation. In all cases he showed himself thoroughly conversant with the broad aspects of both forestry and irrigation and the benefits to be derived from them.

Much of the pleasure of his trip depended on the efforts of the forest rangers, especially in his visits to the Big Tree groves and the Yosemite Valley. He was thoroughly interested in them and in their work, the address to his forest-ranger escort at Santa Barbara being a case in point. His trip through the West should bear fruit in a reawakening of the question of making the most of natural resources, not for the moment merely, but for future time.

Irrigation Surveys on Colorado River.

During the winter of 1902-1903 surveys and examinations have been made by agents of the U. S. Geological Survey along the Colorado River, in a country remote from civilization, where it was difficult to obtain necessary supplies. The surveys started in an almost unknown country, and extended from the mouth of the Colorado to cover an area nearly 400 miles long from north to south and from 1 to 10 miles in width.

The greater part of the work was done by Messrs. Rayburn and Robertson, who made the triangulation surveys. In addition to the survey work, certain areas have been mapped and contours shown at 10-foot intervals. This included all of the irrigable and bottom lands from Eldorado Canyon to Yuma, with the exception of about 40 miles between Ehrenberg and Picacho, which will be completed during the fall of 1903.

In addition to the mapping, investigations were carried on to determine the discharge of the Colorado at Bull's Head above Needles and at Yuma, with daily observations of the temperature and the variation in the amount of silt by quantity and weight; also observations as to the amount of silt carried at various depths of the river. Turbidity observations were also made, and at Yuma samples of the water were taken and forwarded for analysis to the Agricultural Experiment Station at Tucson, Ariz.

Measures of the Gila River were made, and of the amount of water in various ditches from the Colorado. Experiments were carried on as to the best handling of silt in ditches and canals and the beneficial results to be obtained from the collection of sediment on cultivated fields; also as to the velocities at which water erodes the bottoms of canals and at which it deposits silt in them; also of the proper slope of canal banks.

Lands Withdrawn for Irrigation. Pursuant to recent orders from the Secretary of the Interior, certain public lands have been with-

drawn from entry pending action on proposed irrigation projects under consideration by the national government. For the Bear Lake project, on the southeastern boundary of Idaho, near Utah, reservations have been made to include the following:

Townships 10 and 11 S., ranges 36 and 37 E., B. M.

Township 12 S., range 37 E., B. M.

Townships 12 to 16 S., inclusive, range 38 E., B. M.

Townships 6, 7, 8, 9, 14, 15, and 16 S., range 39 E., B. M.

Townships 7, 8, and 9 S., range 40 E., B. M.

To cover the Big Horn project, reservations in northern central Wyoming have been made as follows:

Township 54 N., ranges 80 and 81 W., 6th P. M.

Township 55 N., ranges 81 and 82 W., 6th P. M.

Townships 56 and 57 N., ranges 82 and 83 W., 6th P. M.

Orders withdraw the following for the Cody project in the northwestern part of Wyoming, near the Yellowstone National Park:

Township 52 N., ranges 102 and 103 W., 6th P. M.

Township 53 N., ranges 101 and 102 W., 6th P. M.

Township 54 N., range 101 W., 6th P. M.

Township 55 N., ranges 100 and 101 W., 6th P. M.

Township 56 N., ranges 97 to 100, inclusive, W., 6th P. M.

Township 57 N., ranges 97, 98, 99, W., 6th P. M.

Township 57 N., ranges 95 and 96 W., 6th P. M.

In connection with the Piney Creek project, the following areas have been restored to entry:

Township 51 N., ranges 80, 81, 83, and 84 W.

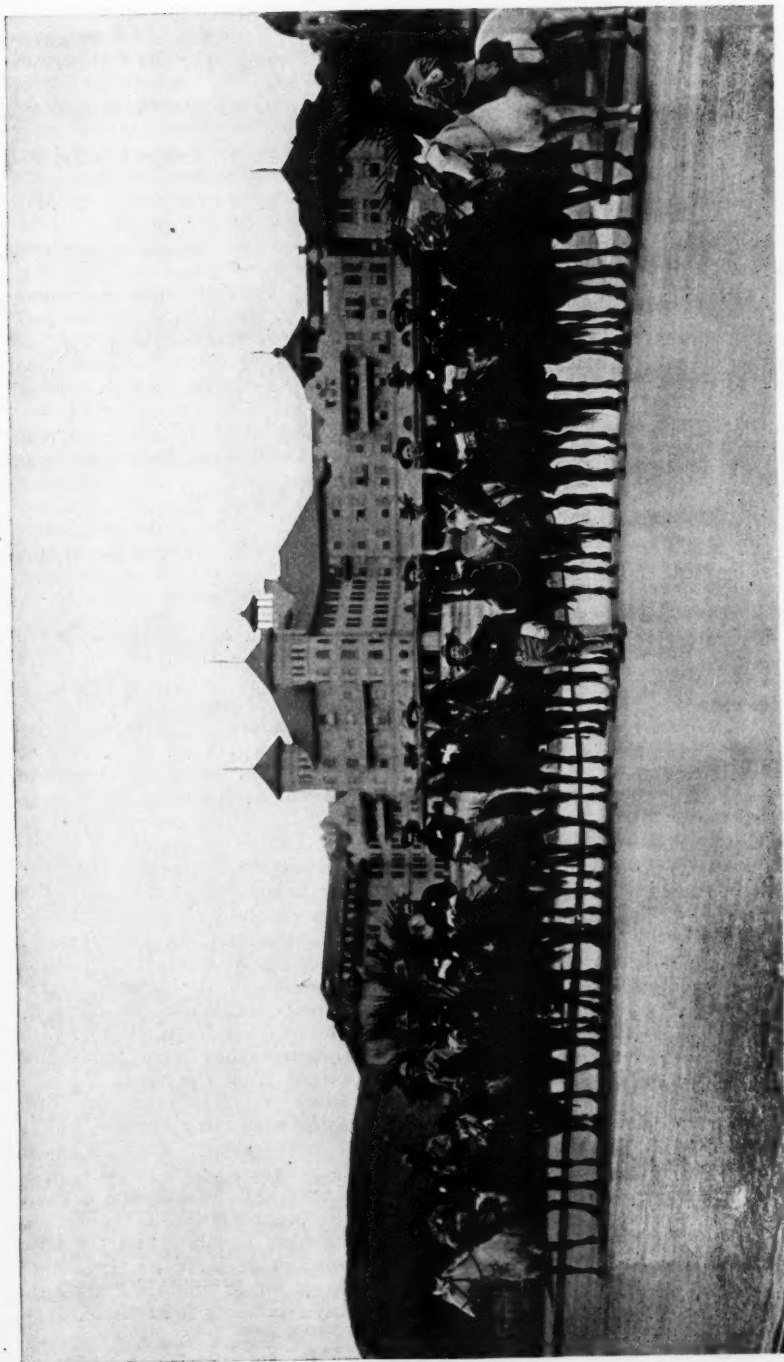
Township 52 N., ranges 80, 81 and 84 W.

Forest Rangers Greet the President.

Forest Ranger Roger S. Baldwin, of the Pine Mountain and Zaca Lake Forest Reserve in southern California, sent FOR-

ESTRY AND IRRIGATION an account of how the rangers acted as escort to President Roosevelt during his visit to Santa Barbara. This account will be of interest to the readers of the magazine, especially in connection with the short address the President made to the rangers, in which he showed his appreciation and understanding of forest work.

Twelve rangers from the Ventura County division of the reserve, under Forest Supervisor Willis M. Slosson, rode 40 miles from Nordhoff to Santa Barbara, where they were joined by twelve others from the Santa Barbara County division. The men wore blue flannel shirts with army buttons, khaki trousers and leggings, and buckskin gauntlets. Behind each saddle was strapped the khaki blouse, and in each hat was a sprig of pine. Bits, bridles, and spurs were polished, and the best horses obtainable were in evidence. When the rangers saluted the President, he immediately recognized them, say-



FOREST RANGERS FROM PINE MOUNTAIN AND ZACA LAKE FOREST RESERVE WHO ACTED AS PRESIDENT ROOSEVELT'S SPECIAL ESCORT AT SANTA BARBARA, CAL. COL. WILLIS M. SLOSSON, SUPERVISOR OF RESERVE, DISMOUNTED.

ing, "Why, these are the forest rangers. I am very glad to see you, boys." During the stay in and about Santa Barbara the rangers were given places of honor in the escort and were made useful in policing the line of march, holding up the trolley cars, turning back intruding teams, and keeping the crowds back.

At the Santa Barbara Mission, Colonel Slosson presented the President with an album of photographs of the reserve in behalf of the Ventura County rangers, all of the pictures having been taken and finished by the rangers themselves. In accepting this gift the President spoke as follows:

"Let me say a word of thanks to the members of the forest force, who acted as my escort. I wish to thank the other gentlemen also, but particularly the members of the forest force. I am, as you gentlemen probably know, exceedingly interested in the question of forest preservation. I think our people are growing more and more to understand that in reference to the forests and the wild creatures of the wilderness our aim should be not to destroy them simply for the selfish pleasure of one generation, but to keep them for our children and our children's children. I wish you, the forest rangers, and also all the others, to protect the game and wild creatures, and of course in California, where the water supply is a matter of such vital moment, the preservation of the forests for the merely utilitarian side is of the utmost consequence, and there are no members of our body politic who are doing better work than those who are engaged in the preservation of the forests, the keeping of nature as it is for the sake of its use and for the sake of its beauty."

Mr. Roosevelt also added, in an "aside" to "the boys" themselves, "and I like the way you ride."

Everywhere the rangers were treated with marked courtesy. They were practically made the guests of the Potter Hotel, and took lunch, on a special invitation from Commander Kimball, in the captain's cabin of the U. S. training ship *Alert*.

Appalachian Mountain Club's Excursion. The Appalachian Mountain Club, of Boston, Mass., has planned a number of outings this

year, some of which have already been given. The principal events on the annual program include an excursion on Decoration Day, or rather, one covering five days from May 29 to June 2, a summer camp in New Hampshire, and a fall trip to the Adirondacks. Special meetings were held May 8, 9, 13, 16, 19, and 30. These included lectures, field lessons in geology, and tramping tours about Boston. The club takes an interest in forestry and related subjects, and has done a great deal to popularize nature study and appreciation in and around Boston.

Yale Forest School Notes. Henry S. Graves, director of the Yale Forest School, sailed for Rotterdam, May 5, to spend

the summer abroad for the purpose of studying the forest methods in use in Europe, the results of his investigations to be used in connection with the work of the Yale School. Professor Graves will visit the most prominent forest schools and museums of Germany, Austria-Hungary, and France, and will make collections of books, instruments, specimens, and other material for use at Yale to aid the students and to illustrate his own lectures. His headquarters, while abroad, will be at the University of Munich, where he studied some years ago.

Professor Graves was at West Point for several weeks previous to his departure for Europe, directing the party of Yale Forest School seniors who have been working on the government reservation connected with the United States Military Academy.

The Yale Summer School of Forestry will be held, as usual, this year at Milford, Pa., the work being in charge of Assistant Professor J. W. Toumey, who has been advanced to a full professorship in the forest school.

Mr. Gifford Pinchot, Forester of the United States Department of Agricult-

ure, has been elected to a professorship in the Yale Forest School, and while he will continue his work and his residence in Washington, he will, by special arrangement, deliver a course of lectures at Yale during the coming collegiate year.

Professor William H. Brewer has resigned the professorship of agriculture at Yale and has been appointed professor emeritus. He has always taken a considerable and active interest in forestry, and was the author of the article on the "Relation of Forestry to the Public Health" which appeared in the January, 1903, issue of FORESTRY AND IRRIGATION.

Recent State Forest Legislation.

Since the publication in the April issue of FORESTRY AND IRRIGATION of notes on "Recent Forest Legislation" additional information has been received concerning acts which have been passed or are still under consideration by various states.

Maine.—An appropriation of \$2,500 for 1903 and a like amount for 1904 for public instruction in forestry was made under section 15 of the original forest act, and the coming fall will probably see a chair of forestry established at the University of Maine. A slight change was made in section 4 of the original act creating a Forestry Commission.

Minnesota.—Twelve amendments were made in the Minnesota forest fire warden law at the recent session of the legislature, which, it is felt, will improve the measure considerably. The legislature also enacted a law authorizing the State Forest Board to purchase land for forest purposes. The board is authorized to acquire by purchase for the state at a cost not exceeding \$2.50 per acre, and preferably at the sources of rivers, any land in the state that is adapted to forestry, but not to exceed in any one congressional township one-eighth of the area of the township, and to take such steps as are necessary to maintain forest thereon according to forestry principles. One-quarter part of the net forest revenue from such lands is to be paid to the respective towns in which

the lands are situated. No appropriation was provided to carry the law into effect. An appropriation was made, however, for the enlargement of the Itasca State Park and for the erection of a building therein, \$20,000 being set aside for the purchase of additional land and \$5,000 for the building. The park is at present under the control of the Attorney General. The legislature enacted as an amendment to a previous law a provision giving a bounty of \$2.50 per acre per year for a period of six years for each acre planted and kept in good condition with any kind of forest tree except Black Locust. This is limited to ten acres to any one person.

California.—An appropriation of \$10,000 has been made for preservation, improvement, and maintenance of the California Redwood Park, in Santa Cruz county. The money is to be used in building roads, bridges, etc., and for the employment of a warden and necessary assistants, \$5,000 to be available during this year and \$5,000 in 1904.

Pennsylvania.—Six forest laws were passed at the last session of the Pennsylvania Legislature. House bill No. 44 is as follows:

"An act conferring upon persons employed under existing laws by the Commissioner of Forestry for the protection of state forest reservations, after taking the proper oath of office, the same powers as are by law conferred upon constables and other peace officers, to arrest without first procuring a warrant, persons reasonably suspected by them of offending against the laws protecting timber lands, and also conferring upon them similar powers for the enforcement of the laws and regulations for the protection of the state forest reservations, and for the protection of the game and fish contained therein, and further conferring upon them the power to convey said offenders into the proper legal custody for punishment; this act to apply only to offenses committed upon said reservations and lands adjacent thereto." A second bill passed authorizes the Governor to appoint a Deputy Commissioner of Forestry and an additional clerk in the office of the Commissioner of Forestry.

A third bill empowers the Commissioner of Forestry and the Forest Reserve Commission to give street railway companies the privilege to construct, operate, or maintain lines on highways bordering on or within forest reservations. A fourth bill allows the State Forest Reserve Commission to expend in the purchase of lands for state forest purposes a sum not to exceed \$300,000 in any one fiscal year. Proceeds derived from the state forest lands, by the provisions of this act, are to go into a special fund which may be used for protecting and improving forest lands or for the purchase of additional land. The fifth act directs the Commissioner of Forestry to erect suitable buildings on the Mont Alto Reservation, or to purchase lands and buildings adjacent thereto, at a sum not exceeding \$6,000. These buildings are to be used as a practical school of forestry for the instruction of forest wardens for the state lands. The cost of the instruction is limited to \$10,000 for the two years ending June 1, 1905. The sixth bill provides for the erection and fitting up of a sanatorium on the Mont Alto Reservation for the benefit of poor consumptives, under the management of the Commissioner of Forestry, and \$8,000 is appropriated for the construction and maintenance for two years from June 1, 1903.

The number of these forest acts and the breadth of interest which they show point to excellent work and great interest in forestry in Pennsylvania, an example which could profitably be followed by other states.

Massachusetts.—A bill was introduced in the Massachusetts Legislature at its recent session providing for the establishment of the position of State Forester, but failed to pass, and will be introduced again next year, when it is hoped it will receive favorable action.

Meantime the Massachusetts Forestry Association has made an appeal to its members for voluntary subscriptions to a fund of \$3,000 for the purpose of employing a forester to work under the direction of the Executive Committee for the coming year. The fund is to be used to pay the salary of a forester at

\$1,200, for his traveling expenses, and for promoting practical work by the distribution of seedling trees and in other ways.

Connecticut.—A law relating to state forestry has recently passed both houses of the Connecticut legislature and is a distinct advance for the forest interests of the state. By its provisions the state forester is authorized to take such measures as he may deem expedient to obtain a profitable growth of timber on the state forest reservation, and to sell such timber when desirable, the proceeds to go toward the maintenance and improvement of the forest.

A former act is amended so that the price at which oak, pine, or chestnut lands may be bought at a sum not exceeding \$4 instead of \$2.50, as formerly; and another significant change is that which makes the reservation at Portland a state forest instead of a "park."

The sum of \$2,000 for the two fiscal years ending September 30, 1905, is appropriated for the work to be done in planting, fencing, protecting the lands from fires and trespassers, and preserving the game, fish, and timber. This is an inadequate sum, but the powers conferred on the forester show a considerable advance, as they enable him to carry out a complete system of forestry on the state forest in Portland.

Forestry in Hawaii.

The legislature of the Territory of Hawaii has passed an act providing for a Board of Commissioners of Agriculture and Forestry, in which provision is made for a forest policy for the islands. This act provides for a superintendent of the Forest Department, who will have charge of all matters relating to forestry, and will be assisted by a corps of foresters and rangers. The matters particularly specified by the act as coming under the jurisdiction of the Forest Department include the custody and regulation of all lands to be set aside under the provisions of the act, and to protect the forests for the purpose of conserving and regulating the water supply. Ways and means are to be devised for making the forests self-

supporting, and measures are to be taken for the exclusion of trespassers, stock, and fires from the public forest domain.

The Governor is authorized, by and with the consent of the Board of Commissioners of Agriculture and Forestry, to set aside lands for forest reservations and to accept the care and control of private lands for forest purposes.

The territorial senate has just passed a bill which appropriates about \$23,500 a year for two years for the Department of Forestry, and providing for the salary of a chief forester at \$3,000. He will have full and direct control of the forest work, being independent of the experiment station and answerable only to the Board of Commissioners, whose members are appointed by the Governor, by and with the advice and consent of the territorial senate.

The Bureau of Forestry at Washington is greatly interested in the work contemplated in Hawaii, and since it is the desire of those persons in the island most deeply interested in the subject, it will give help and advice in the preliminary steps. Mr. William L. Hall, Chief of the Division of Forest Extension, will start for Honolulu in August to assist in organizing the forest work.

Appropriation Vetoed. Governor Odell, of New York, on May 15, vetoed the annual state appropriation of \$10,000 for the New York State College of Forestry, of Cornell University. His action was based upon the adverse report of the legislative committee appointed to examine the state lands in the Adirondacks. This report criticised severely the management of the college forest.

Association Matter. At a recent meeting of the Executive Committee of the Board of Directors of the American Forestry Association the matter of increasing the annual dues of the members of the Association, which was referred to it by the Board, was brought up for consideration. The Committee decided to recommend that the annual dues be increased to \$2.50 a year, and this proposition for increase

be submitted to the members of the Association at the special summer meeting to be held at Minneapolis, Minn., in August. Notice of the proposed change will be given in connection with the official announcement for the summer meeting, and if this action of the Executive Committee is approved, it will go into effect January 1, 1904.

Reclamation Service Notes. Mr. Charles D. Walcott, Director of the U. S.

Geological Survey has just returned to Washington after an extended trip in the southwest. He visited the San Carlos and Tonto Reservoir sites in Arizona, and met and discussed with the people of the Salt River Valley the main points in connection with the government's attitude in carrying out the provisions of the national irrigation act. Later Mr. Walcott visited the Grand Canyon, in connection with geological work that is being carried on in that region.

Mr. Morris Bien, of the Survey, is negotiating for the purchase of lands and water rights in connection with the Truckee project in Nevada.

Mr. F. H. Newell, Chief Engineer of the Reclamation Service, is now making an extended trip through the West in connection with the various proposed irrigation projects that are being considered under the law of June, 1902.

Forestry in Italy In a recent report Mr. Neville-Rolfe, British consul in Naples, refers

to the widespread interest now being taken in Italy in the question of reforestation. In 1877 about 4,000,000 acres were withdrawn from the operation of the old forest laws, as well as about 1,000,000 acres in Sicily and Sardinia. The consequence was a reckless destruction of forests; and now it is generally admitted that the state must step in to save those that are left and to aid in replanting. The question now being discussed is what trees are to be used for the latter purpose. The Italian oak is of little use except for railway sleepers; there is plenty of chestnut all over the country, and pine trees would

grow luxuriantly and prove most useful. The cork tree, however, appears to be the one which would prove economically the most valuable, and it has hitherto been almost wholly neglected in Italy. In 1900 the cork exported was valued at only \$180,000, and much, no doubt, was used at home. But a few years ago Spain exported wine corks to the value of over \$5,000,000.

In Italy about 197,000 acres of land are under the cork tree, chiefly in Sicily and Sardinia; in Portugal the area is 741,000 acres, in Spain 617,000, and in Algeria 694,000 acres. The Calabrian cork forests have been almost wholly destroyed, the trees having been burnt for charcoal, and even Sicily now imports corkwood in considerable quantities. Seventy years ago nearly all the cork imported into England came from Italy. But since then most of the Italian forests have been destroyed for charcoal and to produce potash, and those that remain are being devastated for the same purpose; and no one thinks of replanting the ground, which naturally gets washed away, owing to the absence of trees. Large forests containing a majority of cork trees are continually being released from the forest laws, and there is a risk that the production of cork in Italy will soon cease. Nothing can replace cork in its manifold use, and now, when vast quantities are used in making linoleum and in shipbuilding, an adequate supply of it is of great economic importance.

Connecticut Forestry Association Meets.

The annual meeting of the Connecticut Forestry Association was held at Hartford, May 2. Although the meeting was not quite as well attended as that held a year ago, interest in the work of the Association was not lacking. Mrs. Jessie B. Gerard, of the Connecticut Federation of Women's Clubs, made an address on the work being done by that organization in favor of forestry, and Mr. Mulford, the state forester, who has just been elected president of the Association, told of the work being done with the \$2,000 appropriation received from the General Assembly two years ago. He

said that a portion of the appropriation has been expended to purchase, survey, and protect about 700 acres of forest land near Portland. The work at Windsor, where 60,000 trees have been planted to determine the best means for reclaiming Connecticut forest lands, is being conducted at the expense of the state experiment station. A good portion of the original appropriation is still available.

George R. Griswold, member of the Advisory Committee of the Association, and an agent of the Bureau of Forestry at Washington spoke of the assistance which the federal government offers to owners of woodlands who wish aid in forest work. The following officers of the Association were elected for the ensuing year: President, Walter Mulford, New Haven; Vice-Presidents, T. S. Gold, West Cornwall; Henry Ferguson and Willis I. Twitchell, Hartford; Secretary, Everett S. Geer, Hartford; Corresponding Secretary, Miss Mary Winslow, Weatogue; Treasurer, Alfred Spencer, Jr., Hartford; Auditor, Appleton R. Hillyer, Hartford; Advisory Committee, the officers and Dwight Loomis, P. Henry Woodward, Nathan F. Peck, John L. Dennison, Rev. John T. Huntington, Miss Antoinette Phelps, Theodore Worth, and E. V. Preston, Hartford; Mrs. Jessie B. Gerard, South Norwalk; George R. Griswold, Old Lyme, and Dr. E. H. Jenkins, New Haven.

Opening for Sawmills in Cuba.

Mr. Max J. Baehr, U.S. Consul at Cienfuegos, Cuba, in a late report writes interestingly of the present status of the lumber trade at that port as follows:

"Many complaints have been made relative to the lack of milling facilities for dressed lumber. A lumber dealer of this city, Mr. Hunter, states that there are only two small sawmills here, neither of much utility, and they charge exorbitant prices for dressing lumber—\$9 per 1,000 feet. He has leased for four years, with the privilege of buying at the expiration of that time, the best milling site in Cienfuegos, and he offers

this site free of rent to any enterprising American who will establish a modern sawmill here. He will promise the American all of his own sawing, and no doubt he would receive the work of the many large plantations in this province and that of the new Cuban Central Railroad. Mr. Hunter says that there is a great local demand for doors, window frames, and moldings at very profitable prices, these articles being now imported from the United States under heavy rates of duty.

"The fact that an American firm has established a good sawmill in Habana and is now buying logs in this port and shipping them to the mill, paying freight rates equal to a shipment to the United States, makes it apparent that the establishment of a mill in this city under the conditions mentioned would be very profitable. My own investigations along this line substantiate Mr. Hunter's conclusions.

"In connection herewith, I would mention that the two principal export woods of Cuba—mahogany and cedar—are steadily enhancing in value, and the holders of the choicest timber lands on the north coast, as well as those holding lands adjacent to the new Central Railroad, are advancing their prices. Nevertheless, there are good mahogany lands on the south coast of Cuba that may yet be bought at a low figure."

Operations of the Bureau of Soils.

Surveys will be made by the Bureau of Soils of the Department of Agriculture under Milton Whitney during the current year to cover 27,850 square miles, distributed generally throughout the country. About 33,785 square miles have already been surveyed, and these embrace almost every phase of agricultural industry in the United States. These surveys are valuable, particularly in the West, where the soil types, with their origin and processes of formation, are described, with recommendations as to crops grown, possible yields, adaptability of certain soils to crops, special soil problems, irrigation and drainage, location, origin, and composition of

alkali, and the reclamation of lands from alkali, swamps, or sand. It can be seen that these surveys cover a multitude of important details, and requests are daily pouring into the Bureau for surveys in particular localities. In addition to the regular survey work in charge of field parties, Mr. Thomas H. Means, head of the soils surveys of the United States, is making practical demonstrations of the reclamation of alkali lands, and is at present in the Yakima Valley, Washington, installing a system of drainage which will make available a large acreage now worthless. The Yakima Valley has but 10 inches annual rainfall, and irrigation has everything to do with its development. If the alkali problem can be solved, there will be a manifold increase in farm values there.

Irrigation in India.

In view of the great irrigation works being planned by the federal government, the report of irrigation works for India recently published by the British Government is of interest. According to this report, the "productive works"—that is, those constructed out of loan funds in the expectation that they would prove directly remunerative—yielded a net revenue of about \$8,000,000, the largest on record, equivalent to a percentage of 7.36 on a total capital outlay of \$110,000,000. This percentage has only once been exceeded, viz., in 1897-'98, when it was 7.50. The most profitable results were obtained in the Punjab and Madras, where the percentages were 11.24 and 9.05, respectively. Out of 35 works classed as productive, 13 (including all the canals in Bengal, the Deccan, and Gujarat) are never expected to cover the interest on the capital outlay. The 22 actually productive works yielded 10.11 per cent. One canal, the Cauvery delta in Madras, returned 34.81 per cent. If the total surplus profits realized up to the end of 1900-1901 be added together, the open canals have produced 27½ per cent, after paying all charges for interest and working expenses.

No new productive works were opened

in 1900-1901, but about \$3,000,000 was spent on seven new works in Upper Burma, the Punjab, and Sind. With regard to works constructed out of the famine grant as "famine-protective works" not expected to be remunerative, it is noteworthy that they yielded a return of 2.35 per cent on capital. But this is largely due to the great and increasing success of the Swat River Canal, which alone yielded 10.41 per cent. Five more protective works are under construction. There is a large number of "minor works," which irrigated 2,625,456 acres in 1900-1901, and returned $7\frac{1}{2}$ per cent on capital. Those in Sind proved the most lucrative, yielding 26.18 per cent. Another class of "minor works," for which no capital accounts are kept because they were mostly constructed under native rule, irrigated 2,581,829 acres. Moreover, Madras Presidency has 28,000 tanks and 6,000 irrigation channels, irrigating 3,173,250 acres. The total area irrigated by all descriptions of works in 1900-1901 was 19,646,000 acres, the largest on record. The total capital outlay on works for which capital accounts are kept has been about \$141,000,000, yielding in 1900-1901 about $6\frac{3}{4}$ per cent, after payment of interest, etc. The value of the crops raised on the irrigated area during the year was estimated at \$138,000,000, or approximately the amount of the capital outlay.

Water Power in the Adirondacks.

In connection with the gagings of streams in the State of New York by the U. S. Geological Survey, an examination of the water-power resources of the western slope of Lake Champlain has recently been made by Mr. Robert E. Horton; and two gage stations have been established on Saranac River, the largest stream flowing out of the region. This river has its headwaters in the Saranac group of lakes, in southern Franklin county. These lakes lie at an elevation of about 1,450 feet above Lake Champlain. The stream where it leaves Lower Saranac Lake has acquired, from the extensive drainage area and the great volume of

stored water of the lakes, a large, steady flow, and in falling more than 1,400 feet in its course of 25 miles to Lake Champlain at Plattsburg, it produces numerous waterfalls, which afford not only beautiful scenery but also great water-power facilities, some of which have been utilized. The largest water power on the river, however, affording the unusual fall of 245 feet to drive turbines, remains still undeveloped.

The object of the gagings is to determine the volume of the flow and its variation from day to day, so that the amount of horse-power the streams can furnish may be ascertained. One of the gaging stations is located near Plattsburg, at the mouth, and the second is near the foot of the Saranac group of lakes.

Other streams of the Champlain region—the Au Sable, Bouquet, and Chazy—have also been examined with reference to their industrial value. The streams of this locality resemble one another and are notable from the fact that their headwaters lie in the heart of the Adirondack region, the most elevated part of the state, while the sources of other outlets into Lake Champlain are only 90 feet above tide water.

Studying Forest Fire Problem.

Last year within two weeks over \$12,000,000 worth of timber and other property was destroyed by forest fires in Oregon and Washington. This enormous loss occurred upon a restricted area and represents only a very small part of the annual loss from this source. Every timbered region of the United States suffers year after year from fire. The annual loss is estimated at from \$25,000,000 to \$50,000,000. Forest fires have been regarded as almost inevitable, and few systematic attempts have been made to prevent or control them except in the states of New York, Pennsylvania, and Minnesota, which have efficient systems of fire protection.

The Bureau of Forestry has this year undertaken a thorough study of the forest-fire problem in several different regions. It has placed men in forest

districts to study fires while in the process of burning. Instead of waiting until the fires are over and relying for information on local reports, as has been done heretofore, the fires are now being observed by the Bureau's agents, and full data will be obtained as to how they were caused, how fast they burn, what conditions favor or hinder them, and just what damage they do to the soil and to tree growth. Each agent of the Bureau has been assigned to a district and is investigating all fires that occur within his territory. For example, one man studies a lumber tract, another a farming district, a third a turpentine orchard.

In connection with this detailed study, the agents will observe the methods of fire protection practiced by railroads and other owners of timber lands. The fire warden systems of the states which have forest-fire laws and the patrol system in use on the federal forest reserves will also be observed closely.

By such methods the Bureau of Forestry hopes to replace with carefully gathered facts the vague general notions that now exist about forest fires. When the problem is solved for any particular region, the Bureau will be ready to recommend methods of fire prevention and control for the private land owner, and to suggest forest-fire legislation for the various states.

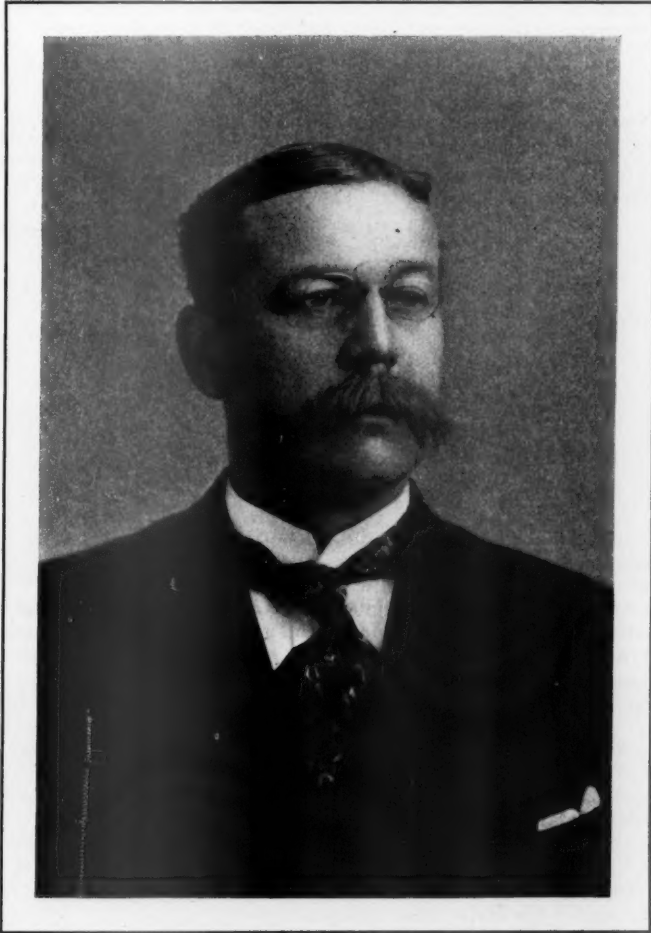
The investigation is now in progress in northern Florida and southern Alabama and Georgia under the direction of Ernest A. Sterling. H. J. Tompkins, with a small corps of assistants, has begun the work in Minnesota, Wisconsin, and Michigan. Later in the season a study of forest fires will be made on the Pacific coast.

Uncompahgre Valley Water Consumers Act. At a meeting held at Olathe, Colo., May 5, several hundred farmers and business men, with delegates from all the canal companies of the Uncompahgre Valley, were empowered to incorporate to form a legal body to deal with the federal government in all matters which may arise in connection with the

Uncompahgre Valley reclamation project, one of the five great irrigation undertakings the government has now in hand. The organization was accomplished without any friction, four officers and an executive committee of seven being elected by the delegates to draw up a constitution and by-laws and to incorporate for the transaction of business.

Mr. A. L. Fellows, resident hydrographer, who has the work in charge for the government, addressed the meeting, outlining the scope of the undertaking and explaining the rights and duties of the consumers. From an engineering standpoint, he said, he believed the Uncompahgre project to be the greatest of the five irrigation undertakings now under consideration by the national government, and he estimates that 125,000 acres will be under the main canal at a cost not to exceed \$25 an acre to the consumers, the amount to be paid in ten annual installments. He suggested that some revenue might be derived from power developed at the dam, which would materially decrease the cost to the farmers. Mr. Fellows also suggested the plan of organization whereby complications could be avoided by having the government deal with the corporation in the adjusting of all claims, even to buying the ditches; if the corporation could make satisfactory terms with ditch owners, the government might advance the money. He explained that there would be several canals leading from the Gunnison tunnel, and if the Gunnison River did not furnish enough water to irrigate all of the valley at its lowest water season, storage reservoirs would be constructed.

It will be seen that the incorporation of the water consumers simplifies the matter of dealing with them, as was done in the case of the Tonto Reservoir, described in our May issue. The question of dealing with water users will probably be simplified in this manner with all of the projects, making such minor modifications of detail as may seem to be required by local conditions. A description of the Gunnison River tunnel may be found in the April issue of FORESTRY AND IRRIGATION.



HON. FRANCIS E. WARREN,

UNITED STATES SENATOR FROM WYOMING.

HON. FRANCIS E. WARREN, United States Senator from Wyoming, has been one of the most conspicuous and energetic advocates of irrigation legislation in the United States Senate. Coming from a state in which originate most of the large rivers whose waters are used in irrigation, it is fitting that he should originate many of the ideas which have been embodied in national legislation relating to irrigation.

Senator Warren was born at Hinsdale, Mass., June 20, 1844; he received an academic education, entered the 49th Massachusetts Volunteers as a private, serving from 1862 to 1865; he then engaged in farming and stock raising in Massachusetts until 1866, when he removed to western Dakota, the country afterwards being organized into the Territory of Wyoming. He engaged in the mercantile business in Cheyenne, and became interested in live stock; later he was elected governor of Wyoming Territory, and subsequently became the first governor of the new state. He has served in the United States Senate since 1890, his present term expiring in 1907.

Of large frame and equally strong mental grasp, Senator Warren is at all times a commanding figure, and in his advocacy of irrigation legislation he has attracted attention to the

necessity of action by Congress. His principal efforts were at first directed along the line of securing amendments to the River and Harbor Bill, by which reservoirs should be built by the general government as part of its system of river improvement, carried on by the corps of engineers of the United States Army. He secured the passage of the item authorizing surveys in Wyoming and Colorado, and resulting in a report on the subject, prepared by Capt. Hiram M. Chittenden.

When it became apparent that the River and Harbor Bill could not become the means of national irrigation, Senator Warren lent his aid to the passage of what is known as the reclamation law of June 17, 1902. In the administration of this law Senator Warren has taken great interest, and by his counsel and advice has sought to make the operations of the law of advantage to the country as a whole as well as to his own state.

FORESTRY AT HONGKONG.

DESCRIPTION OF A NOTEWORTHY EXPERIMENT IN TREE
PLANTING THAT SHOULD BE IMITATED IN THIS COUNTRY.

BY

MARK WINCHESTER,

BUREAU OF FORESTRY.

A RETROSPECT on the work of the English foresters at Hongkong along planting lines may be of interest in this country because of the proximity of that section of Asia to the new possessions of the United States. Of course the conditions are by no means similar, because the Philippines at the present time are to a great extent heavily forested; but if the time ever comes when we are to carry on planting operations there, we may profit greatly by the mistakes and experiences of these foresters.

Hongkong was ceded to Great Britain in 1842, and the city of the same name has been built almost entirely since that time. Along the water front is a narrow strip, where are situated the wharves, principal places of business, and the Chinese quarter. From this commercial district the cliffs rise abruptly to a height of 2,000 feet, and on this steep hillside, on streets terraced one almost directly above the other, are the homes of the European residents.

When the English first came, this hillside was simply a series of barren rocks, with a few rank weeds here and there, and perhaps a little herbage and brushwood along the margins of the streams, as its only vegetable growth. Today the incline from base to summit, taken in connection with the superb ocean view, can be classed as one of the

most beautiful combinations of natural and artificial scenery in the world. The streets are well shaded, and the white walls of the houses contrast prettily with the green foliage. Everything is spotlessly clean. And it has been by the united efforts of the forester, the architect, and the engineer that this marvelous change has been wrought.

The first record of forest work on the island is in the late seventies. In 1878 five thousand cocoa palms were planted for ornamental purposes. It was evidently not the proper zone for them, because, although they flourished as far as foliage is concerned, and therefore answered the purpose for which they were put in, they did not bear any ripe fruit. The two years intervening between 1878 and 1880 were enough to demonstrate that it would be extremely difficult to get trees to grow on the side of the hill, for the plantings of 1878 and 1879 on the exposed slopes were complete failures.

Until 1881 all of the planting was done with two-year old plants reared in nurseries established near the planted territory. In the planting of 1881 a departure was made from the plan of previous years, and 60,000 of the trees resulting from this season's work came from seed planted in place. These were all Chinese White Pine (*Pinus sinensis*),



GENERAL VIEW OF THE HILLSIDE AND HARBOR AT HONG KONG.



RESULT OF PLANTING AND TRANSPLANTING ON A HILLSIDE STREET.

and in fact this species has been used predominantly in all of the operations. Planting in place is far more economical than the nursery method, because it saves the nursery expenses, the transfer of the young trees to the place of planting, and the labor of setting them out. In addition to the fact that it was the cheaper method of the two, the seeds planted in place seemed to succeed better than did the two-year old plants, for the reason that the roots of the latter were so long that when they were moved from their nursery bed sufficient soil did not adhere to give them a start in their new situation.

The cost of this planting is but one-fifth of that by the nursery plan. The losses are perhaps one-third of the whole number of seeds put in. At the end of the first year the plants reached a height of from three to six inches. The gaps left by the plants which fail to come up are filled in about two years after the other plants show themselves above the surrounding vegetation. Under the most favorable conditions, in sheltered ravines and on southern aspects, success has attended this kind of planting; the trees on the hilltops, however, as has been the case with those planted by other methods, are failures, although they will sometimes grow for a few years.

In 1883 twenty-five varieties of bamboo were tried. These were very generally successful, and several years later more were put in.

The great difficulty was to get trees to grow at the higher elevations, both because of the exposed situation and because of the scantiness of the soil. At a monastery near Hongkong, at an altitude of about eight hundred feet, were observed some fine large Sweet Gum trees (*Liquidambar formosana*.) The wood of this tree is in great demand in the manufacture of tea chests, because it has absolutely no odor. A few years later a number of trees of that species were put in and succeeded fairly well. The Japanese Pine (*Pinus thumbergii*) was also tried at the higher levels and did well, as did the Camphor tree up to five hundred feet, under good soil conditions. This latter tree grows to an

enormous height, and is exceedingly valuable for the making of clothes cabinets and chests. A large number of them were also set out along the road, where they have grown vigorously.

This road planting has been a very important feature of the Hongkong work, and it was begun in almost the first year of which any record has been kept. Bamboos, Pines, Banyans, and indigenous Oaks were the principal species used. In connection with this work of beautifying the roads, some interesting results have been obtained by transplanting. Banyan trees one hundred feet in height were lopped down to fifteen or twenty feet, bound around with straw, and transplanted to the edges of the roads with almost perfect success.

The adaptability of these trees and their persistence in the face of adverse circumstances are very striking to one walking along the hillside streets. In many cases where they are planted on the downhill side the drop is very abrupt and the soil covering correspondingly scanty. In these cases the tree, instead of giving up in despair, burrows with what roots it can, sending the others out along the top of the ground, and continues to grow and flourish as though the conditions were favorable.

In 1888 broadcast sowing was begun, both on the slopes and along the roads. A bulletin of 1901 says, after comparing results for three years, that broadcast sowing is as good as the expensive methods. The fact that the latter cost \$54 an acre and the former but \$5 makes this a rather startling statement.

Although Chinese White Pine has always been by far the most prominent species in the planting, in later years others have been increasingly used. *Cunninghamia sinensis*, *Tristania conferta*, Masson's Pine (*Pinus massoniana*), and the Gums are the best of the newer species, the two latter succeeding fairly well even at the high elevations. Japanese Cedar (*Cryptomeria japonica*), Japanese Pine, Camphor, and Eucalyptus are also good trees for this locality. The foresters here add their testimony



SECTION OF SLOPE PLANTATION, SHOWING GRADATIONS IN TREE GROWTH AS THE ALTITUDE INCREASES.



ROAD PLANTING NEAR THE SUMMIT.

to the statement, which seems to be pretty universally accepted now, that the prevention of malaria by *Eucalyptus* planting is a fallacy.

The success they have had with planting in this vicinity cannot be said to have been brought about entirely under the benign influences of nature, for she has interposed some rather serious obstacles. The first great difficulty was to find a good time for planting, because in the autumn, the best season for putting in the trees, the rainfall is very poor.

The typhoons which sweep over that coast of Asia did considerable damage, although many of the trees which were blown down were straightened and braced up, and after a period of nursing were restored to their former strength. Much trouble was caused at different times by birds eating the seeds of the in place and broadcast sowing.

Many of the *Tristania conferta* and Japanese Cedar fell victims to the white ant, and the Pines and Banyans suffered greatly from a caterpillar pest which appeared in 1893, 1894, and 1895. In the case of the Caterpillars (*Eutricha punctata*), however, many of the trees, even after losing their foliage, survived and regained their vigor. No way was found of getting rid of these caterpillars except the laborious method of hand-picking, which anywhere but in an exceedingly low wage country like China would be utterly impracticable. It has

been recorded as a rather peculiar fact that the times when the caterpillars were most plentiful were also the worst years of the bubonic plague.

Mahogany was tried in the plantations, and although for a time it grew well, it was later practically ruined by borers. Fire, the enemy at large of the forester, has not failed to visit the work of the Department there. On the aspects exposed to the winds and the terrific heat of the sun, everything in the dry season is in a thoroughly combustible condition, and the tree planters, in order to protect their work, have been obliged to clear several miles of fire barriers, some ten and some fifteen feet in width.

At the present time the Forest Department at Hongkong is doing but little broadcast and in place planting, because the area for this has practically been exhausted. They are, however, still doing a good deal of work along the roads and streets. From now on their principal task will be to protect and care for the plantations already under way. Experiments with new species will also be pushed vigorously.

The problems confronting these foresters have been many and vexatious. Theirs has truly been in all respects an "up-hill" work, and that they have transformed so much of that treeless slope into a veritable hanging garden is a testimonial to their energy and persistence.

NOTE.—The foregoing description calls attention to the great need of such planting in the United States. No doubt every reader of this article knows of spots practically barren of tree growth near our leading cities that might be made beautiful and healthful with even less energy and persistence than has been required in the work at Hongkong. It is an example well worthy of emulation by us.—[EDITOR.]



PRACTICAL IRRIGATION IN HUMID AREAS.

METHODS EMPLOYED AND RESULTS OBTAINED
FROM THE APPLICATION OF WATER TO CROPS
IN REGIONS OF CONSIDERABLE RAINFALL.

BY

BRISTOW ADAMS.

PART I.

LEAVING out of consideration a narrow strip of country along the Pacific Coast from the Canadian border to the northern boundary of California, where the average annual rainfall approximates 100 inches, the humid areas of the United States may be said to lie wholly east of the 100th meridian. In this region the average precipitation amounts to about 35 inches, the heaviest rainfall, 60 inches, occurring in Florida in the southeast, and gradually decreasing toward the northwest to about 15 inches in the Dakotas.

Irrigation has naturally attracted more attention in the arid states, in the region from the Cascade and Sierra Ranges on the western border of the continent eastward to the states bordering on the Mississippi River, than it has elsewhere in the country. This is so for the simple reason that that section has needed irrigation in order to properly grow and mature crops.

The humid area, conversely, has not taken such an interest in developing irrigation, depending, in the main, on natural rainfall to mature crops and provide for all needed moisture. Lately, however, and particularly through the greater interest in irrigation in the West, eastern farmers have been looking into the subject of irrigation as a means of increasing the value of the natural resources at hand. Also it has proved distinctly advantageous to make use of water artificially applied during the periods of drouth which are apt to occur in the eastern growing season. It can be said that the East is learning from the West, although the first irrigation plants in the country, leaving out of consideration those of the aboriginal

nations in the Southwest, were on the Atlantic seaboard, with Boston as claimant for honors as having had the first irrigation ditch in the country.

As noted in an article on the general practice of irrigation, published in the May number of *FORESTRY AND IRRIGATION*, there is hardly a state in the Union which does not make some use of irrigation, but it is a remarkable fact that the two states of the humid area having the most copious rainfall—Florida and Louisiana—have the most extensive irrigation plants. In general it may be said that the Southern States, more favorably situated than the rest of the country, are paying more attention to applying water to crops than other states in the humid regions where the need would seem to be more urgent.

Detailed descriptions of the various plants used in the Eastern States will give a general idea of how the work is being done, and of the results which follow.

Massachusetts.—Truck and fruit farms in the neighborhood of Boston have made use of irrigation for a long time, and the success achieved led many farmers to try the project. At first there was not sufficient knowledge of methods to be employed among those who recently took up irrigation. A number of gardeners near Boston use the city water supply, while others have independent sources of water and use pumps, either steam, gasoline, or wind-propelled.

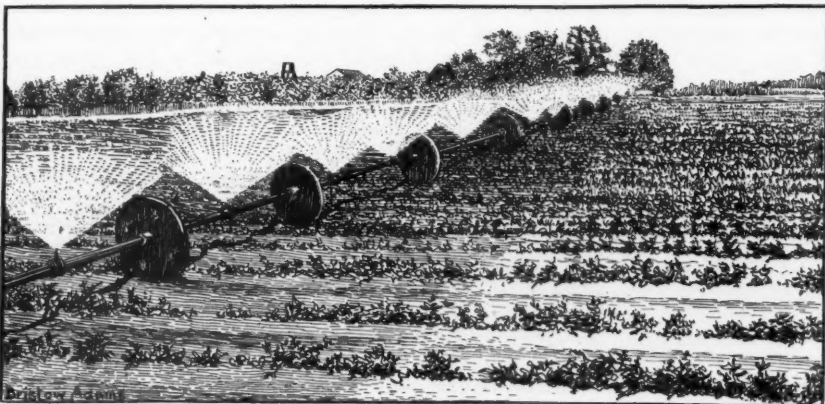
The Hittinger Fruit Company, of Belmont, Massachusetts—a suburb of Boston—is one of the best-known firms which makes use of irrigation in that neighborhood. Their business is fruit culture in connection with greenhouses

for small fruits and early vegetables. The firm admits that it made the mistake of going extensively into the field of irrigation without sufficient tests of the value, and have lately done away with a large part of the irrigation system which was first established on an elaborate scale. They say that they find that fine fruit is produced rather through frequent cultivation than the constant application of water. This admission shows that they fell into the most common and most injurious fault in the application of water, and one especially attributed to beginners, that of over-irrigation. Now, on the other hand, according to their own testimony, they have done away with irrigation, yet none of their crops is raised without the artificial application of water. This illustrates the difficulty experienced in getting statistics of irrigation in the East, where the garden hose and small ditch are not conceived to be irrigation in any sense worthy of the name.

The Hittinger Company plants its strawberries in rows on little raised hills and waters at infrequent intervals during the growing season by letting water run between the hills from open pipe or hose. Lettuce is not "irrigated" at all, yet the ground is thoroughly wet to the depth of two or three feet, first being watered with open hose and then by trenches in which the water is allowed to run for a day at a time. The lettuce is then planted, and when ready for

market is brighter, more crisp, and has been grown with less trouble from plant diseases than if it had been watered every day or two. This, allowing for the difference in the crop and the scale on which it is planted, is identical with the methods in use for the extensive culture of lima beans in California, as described in the May number of *FORESTRY AND IRRIGATION*.

The Hittinger plant makes use of a special and very simple apparatus, and one that is valuable where there are inequalities in the surface of the ground, for by its use the expense of leveling and grading can be done away with. The water supply is obtained from one of the Boston city reservoirs, and comes under a pressure of 25 pounds to the square inch. In the center of each quarter acre there is a firmly planted post, six inches square and about seven feet high. On top of this post is pivoted a 20-foot beam. A two-inch pipe runs from a main pipe to the top of the post, where, by means of an expansion joint, it divides to form two ten-foot arms, to the ends of which are coupled about twenty feet of garden hose, terminating in an ordinary nozzle. As the whole apparatus revolves, it can be seen that one man, with a force of water which will throw a stream from 30 to 40 feet, can effectually irrigate nearly half an acre, and can so regulate the supply as to suit the needs of a crop under any condition or stage of growth. Six of



MOVABLE SPRINKLERS ON FARM OF DAVID ASTLE, VINELAND, N. J.

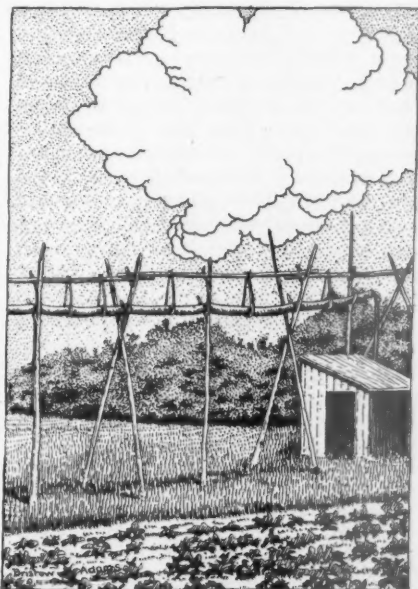
these distributing stations will suffice for $2\frac{1}{2}$ acres, and where water can be obtained under pressure the system is inexpensive. Where a natural pressure does not exist, a small force-pump used during the watering process would add but little to the cost.

New Jersey.—In this state, as well as in Massachusetts, sprinkling is used instead of the commoner application directly to the soil by furrows or flooding. In some cases a network of overhead pipes furnished with sprinklers is so arranged that by the simple turning of a valve an actual rain can be closely imitated over the area under the pipe system. William Ash and Sons, of Vineland, N. J., installed an extensive system based on this plan, but later discarded some of it because of the trouble caused by rust in the pipes. It might be possible to obviate the danger from rust, but unless that is done valves will be clogged and joints will leak. The great advantage of the overhead pipe apparatus comes from the convenience in handling and the absolute doing away with the expense of labor connected with the application of the water. Again, where shade-grown crops are to be irrigated, the overhead framework of pipes forms a support for the cloth used for shading.

Another gardener of Vineland, N. J., uses a large supply pipe along one side of the fields to be irrigated, and at intervals along its length are lateral pipes with couplings and valves, to which a section of rubber hose is attached, and this in turn is connected with a long pipe which extends across the field, supported on wooden disks or wheels at intervals of about 12 feet. Starting at one end of the tract to be irrigated, the long lateral pipe is connected with the supply pipe at the side of the field by means of the rubber hose, and as the ground is watered the pipe is pushed along on the wheels to the limit of the hose, when it is uncoupled and attached to the next lateral vent, and so on until the whole area is watered. The advantages claimed for this device are: that the water, by means of the sprinklers placed at intervals on the lateral pipes, can be regulated to the

needs of different parts of the ground and crop; that there are no permanent fixtures in the field itself to interfere with thorough cultivation or to take up any room from the crops. The rows or furrows of the field are run the same way that the large wheels progress, so that there is no crushing of the crop, the wheels being made to run in the furrows or between the rows.

Still another market gardener in the same neighborhood uses the same kind of a main pipe along the edge of the field, but at right angles to the furrows



CANVAS HOSE SUPPORTED ON POLES FROM A GASOLINE-ENGINE PUMPING STATION.

instead of parallel with them. From this extend lateral outlets, with valves and couplings, but to these a hose is attached, which carries water for furrow irrigation. A modification of this form is used in almost all cases where small fruits and vegetables are grown by irrigation, though in many instances tarred cotton duck is substituted for all but the main lines of pipe. This hose was introduced by Mr. George A. Mitchell, of Vineland, though notable adaptations have been made of it,

among them a very serviceable sluice hose with open lateral ports, which may be regulated by tying with stout cord, this latter improvement being the device of Mr. George H. Patch, of Wisconsin.

This hose is easily made, the canvas being torn into strips approximately

the boiled oil alone is used. Such hose will not stand great pressures, but for many purposes will be found inexpensive, conveniently handled, and adapted to a variety of uses. It can be run along the ground or supported on poles in the air. Couplings can be made with galvanized iron pipe inserted and tied



FORMS OF GALVANIZED IRON LATERALS FOR USE WITH OILED DUCK HOSE.

three times the diameter of the pipe desired, with an allowance for width of seam, which is sewed on a heavy sewing machine. The hose is then saturated inside and out in boiling coal-tar and linseed oil, four parts to one. It can then be wrung through a clothes-wringer and left ten days to dry. In some cases

with stout cord, and lateral branches may be made with T joints of any light pipe which will fit the hose. A majority of the truck gardeners of New Jersey use gasoline engines, as being cheaper, easier to operate than steam, and also because a licensed engineer is not required by law to operate them.

(Continued in July number.)

THE FORESTS OF CANADA.

BY

HENRY S. CULVER,

U. S. CONSUL, LONDON, ONTARIO.

THE composition and present condition of the timber areas of Canada are not generally understood by the people of the United States. They are too much inclined to look upon them as one unbroken forest rather than as separate and distinct areas, and they erroneously associate with these different areas the best timbers known to have their habitat in this northern country.

A general idea of the composition of the Dominion forests may be formed by ignoring the minor belts of timber and the isolated forest reserves and dividing the main forest lands into three great belts or divisions.

This, of course, necessitates leaving

out of the report the forests of the maritime provinces, which are extensive and valuable, covering about one-tenth of the area of those of Ontario and Quebec; but the forests of New Brunswick and Nova Scotia may be compared in a general way to those of Maine. By the division suggested, we have three great timber belts in the Dominion: the northern or spruce belt, the southern or commercial belt—both east of the Rocky Mountains—and the British Columbia belt, west of the Rocky Mountains. In point of value, for general purposes the western or British Columbia belt is far superior to either of the eastern areas mentioned, for the reason that the climate, tempered as it is by the warm

waters of the Pacific Ocean, promotes a more perfect growth and development of the different species. Here is found not only the valuable Red Fir, or Oregon Pine, generally distributed throughout the entire province along the coast and on the mountains, but also the Red Cedar, the Western Spruce, the Yellow Cedar, the Hemlock, the Balsam Fir, the Western White Pine, the Western Yellow Pine, the Maple, and the Western Oak in such quantities as to make this, perhaps, the most valuable timber belt on the North American continent. This belt extends from the forty-ninth parallel north to the sixtieth parallel, a distance of some 770 miles, and is from 200 to 300 miles wide. The best timber does not extend to the extreme north. That portion is covered with Black and White Spruce, and constitutes a very extensive pulp-wood range.

Dr. Dawson, in describing the Red Fir, or Oregon Pine, says:

The best grown specimens are found near the coast, in proximity to the waters of the many bays and inlets which indent it. Here the tree frequently surpasses 8 feet in diameter at a considerable height above the ground, and reaches a height of from 200 to 300 feet, forming prodigious and dark forests. The timber is used for house-building, shipbuilding, wharves, piles, masts, furniture, fencing, etc.

Next in importance to the Oregon Pine is the Red Cedar. Mr. J. R. Anderson, deputy minister of agriculture for the province, says:

"The tree is very generally distributed in Vancouver Island and on the coast of the mainland to the westward of the Coast range. Scarce in the dry central plateau, it again occurs in considerable quantities in the Selkirk and Gold ranges of the mountains.

"As in the case of the Douglas, or Red Fir, the finest specimens are to be obtained in proximity to the seacoast. Here the tree attains an immense size, an idea of which may be formed from the fact that some of the native canoes, which are all hewn out of the trunks, are 6 feet and more from the level of the gunwale to the bottom.

"Although second in importance as

regards its economic value, it is a more valuable wood than the Oregon Pine, being used principally for interior finishing, cabinet-making, doors, shingles, and posts."

But this region, by reason of its great distance from the markets of the East and the lack of cheap transportation, will remain comparatively in its primeval state until the eastern forests, which are more accessible, are nearly exhausted or until better transportation facilities are afforded.

The northern belt is perhaps greater in extent than all the other timber belts and reserves of Canada combined. According to the best authority, it extends from the eastern coast of Labrador north of the fiftieth parallel in a northwesterly direction to Alaska, a distance of some 3,000 miles, with an average width of perhaps 500 miles. This vast strip of timber land, if placed upon the territory of the United States, would extend from Maine to California, and from the southern shore of Lake Erie to the northern boundary line of Georgia. It is known as the spruce forest of the Dominion, the great bulk of the timber being of that species—black and white—the other important trees being Larch and Poplar.

Although this region has been but partially explored, it is claimed that many of the trees in the southern portion are of a lumber-producing size, but the greater portion is fit only for pulp.

When it is considered that spruce is distributed in vast quantities through all the forests of Canada, and that an almost incalculable amount will be produced in this great northern belt, it is hardly exaggeration to say that the Dominion possesses an inexhaustible supply of pulp wood.

Dr. Bell, of the Geological Survey of Canada, says of the forest:

"In our northern or spruce forests, a bird's-eye view of the country would show a patchy appearance, due to the fact that these different areas have been burnt over at different times.

"The White Spruce attains its full growth in about one hundred and fifty years, and there are second-growth patches of this tree of all sizes and all ages, up to one hundred years or more,

together with some of the old forest. Spruce trees grow much more rapidly up to about thirty years than they do afterwards. The addition made between thirty and one hundred years is much slower."

In describing its area, he says:

"The area of our northern forests may be reckoned as forty-four times as great as that of England. Any one of these forty-four parts will produce wood enough to supply the ordinary demands of the present population of Canada—that is, 5,000,000 people could get what is required for mining, fuel, etc., by taking the timber from a space the size of England—and would be able to allow the other forty-three equal parts to be in reserve or used for export."

This great region, which has remained so long unexplored, is about to be brought within the reach of civilization through the railway being built from Sault Ste. Marie to Hudson Bay. This will make available at least the timber growing around the bay and along the line of the road, and may possibly provide a more accessible field of pulp wood than can be obtained in any other way for the rapidly growing industries of the "Soo."

The southern or commercial timber belt spreads over a very wide territory. It comprises that portion of Ontario and Quebec lying between the forty-fifth and fiftieth parallels of latitude and bounded on the east by the St. Lawrence River and on the west by the Great Lakes and Manitoba. Great interest centers in this great timber region by reason of its proximity to the manufacturing centers of the United States and because it contains the most valuable timber for lumber east of the Rocky Mountains.

It is not, however, a compact and unbroken belt of first-class timber. Climatic conditions seriously interfere with the development and growth of some of the best species of timber that inhabit this region, for none of the best ones extend farther north than the watershed between Hudson Bay and the Great Lakes, approximately the fiftieth parallel of latitude, and many of them find their northern limit far south of this parallel. Besides, all timber deteriorates

in value and becomes less in volume as it approaches the limit of climatic growth. The composition and extent of this timber belt can be better understood by taking a map of the Dominion and tracing its boundaries and noting the northern limit of the most valuable species. The forty-fifth parallel, which is approximately the southern limit of this region, cuts out entirely one very valuable species—the Black Walnut—whose northern limit of growth is the latitude of the city of Toronto, while a few miles north of this parallel is the northern limit of Red Cedar and White Oak. A line drawn from the city of Quebec to Sault Ste. Marie will designate the northern limit of Beech, while a line drawn from the northern part of New Brunswick to the north shore of Lake Superior will mark the northern boundary of Sugar Hard Maple. Two other valuable species which have their northern limit within this belt are Elm and Birch.

The king of the northern forests is White Pine, which has its northern limit, as have also White Cedar and Red Pine, at this fiftieth parallel of latitude. This region is now virtually its only home in the Dominion of Canada. It was at one time supposed that it had a very extensive northern range, but Dr. Bell states that its distribution is comparatively southern, very little, if any, being found north of the fiftieth parallel, which marks the watershed between Hudson Bay and the Great Lakes. This belt would furnish an enormous supply of excellent timber but for the destruction wrought by forest fires. Dr. Bell calculates that about one-third of this territory may be considered as under second growth up to about 10 years of age, one-third as intermediate, and one-third including trees of 100 years or more, and this applies doubtless to all the forest areas of Canada; but as to this particular belt, which lies at the very doors of the great manufacturing establishments of the United States, and is the one foreign timber region upon which we rely, one must admit that the available supply of first quality timber is alarmingly limited.

The Canadian forests have never been called upon to pay the enormous tribute to multiplying industries that our forests have; but they have been decimated by the speculative lumberman and the improvident settler, and ravaged by fire until those which are most accessible bear little resemblance to their primeval state.

But it is not too late for the Canadian people to preserve what is left of their great timber reserves, and by a vigorous and judicious system of reforestation they may be able to meet every demand for their best timber for a long time to come. They are awake to the responsibility and are taking measures to preserve what is left and to reforest the waste places. In this connection I quote from an interesting memorandum addressed to the commissioner of crown lands by Thomas Southworth, clerk of forestry for Ontario. He says:

"I have devoted a great deal of time and study to the question of the feasibility of restoring and preserving the growth of White Pine upon lands not adapted for settlement which have been wholly or partially cleared either by lumbering operations or by fire. Until lately such a measure has not been considered possible except at an outlay which, under existing circumstances, would preclude its adoption. Recent investigations, however, have thrown new light on the matter by dispelling the erroneous views formerly current, and still held by some, as to the natural process of forest reproduction. It was popularly believed that when the original pine forest was destroyed and the soil remained uncultivated the succeeding crop of spontaneous vegetation consisted in all cases of trees of a less valuable character, such as Poplar, Birch, Bird Cherry, and Jack Pine, and that some natural law precluded a second growth of White Pine. The circumstance which gave color and plausibility to the theory was that in the majority of cases lumbered-over lands were subjected to the ravages of fire, frequently more than once, which swept away not merely the undergrowth, but the seeds deposited in the forest soil, so that when after the lapse of years vegetation again

appeared the lighter seeds, carried long distances by the wind, were the first to occupy the soil.

"Careful examination of many cut-over tracts and information derived from various sources afford abundant evidence that while the result of repeated fires may be to utterly destroy the White Pine so as to prevent its spontaneous reproduction, the first crop will naturally, and as a rule, be succeeded by a speedy growth of its own kind, and that, where protection from fire is afforded, these seedlings supply the vacancy left by the removal of the original forest and furnish a merchantable crop within a reasonable time. Already, there are large areas of cut and burned over land on which young White Pines are found intermixed with less valuable trees, which only require to be guarded against forest fires to yield a profitable crop long before the present virgin timber resources of Ontario are exhausted. Even after a district has been burned over, White Pine or Spruce will spring up where the seeds latent in the soil have not been burned, or where enough of the original trees remain to furnish seed. Near the village of Plevna, in the county of Addington, a tract of land of considerable extent has been withdrawn from settlement on account of the valuable crop of young pine timber which has grown up during the past twelve or fourteen years' immunity from fires. There are many such tracts scattered throughout the province, unsuited for general agriculture, which will in due course contribute to the timber supply.

"The problem of reforestation is greatly simplified when it is understood that all that is really required to be done in most cases to secure a certain, if somewhat tardy, restoration of the original forest growth is to allow the reproductive energy of nature to have full play, with immunity from fire. So long as it was supposed that when the first pine crop was removed the second growth was invariably of an inferior and comparatively valueless character, and that nothing short of artificial planting at enormous cost would restore the pine growth, it is not surprising that a

policy of mere exploitation was pursued, by which it was sought to harvest the original crop of virgin timber as fast as the demands of the market warranted, and in a manner that would provide the greatest revenue to the province.

"Since it has been established that it is possible to profitably grow successive crops of our most valuable trees on our non-cultivable lands, the question of the cheapest and most expeditious plan to pursue in this regard becomes very important. The greatest factor

is, of course, the prevention or lessening of forest fires, and in the effort to do this many things must be considered. The withdrawal of certain lands from settlement, the degree of restriction found necessary upon the liberty now enjoyed by hunters, tourists, prospectors, trappers, and others in the crown domain, the means of checking fires once started, and many other things must be carefully considered in enacting legislation with this aim in view."

IRRIGATION OF SUMATRA TOBACCO.

DESCRIPTION OF AN INTERESTING INDUSTRY NOW FLOURISHING IN FLORIDA.

BY

CLARENCE J. BLANCHARD.

FLORIDA, in the minds of Northerners, has been associated so long with fruits and flowers that it comes rather in the nature of a surprise to find agriculture developed there on a scale commensurate with many sections of the North. Northern brains, money, and push are responsible in some degree for the revival, but Floridians are awakening rapidly to a better appreciation of the latent possibilities of their state, and while welcoming their brothers from the North are themselves adopting the latest ideas of farming with success. Scientific methods, improved machinery, and diversified crops are gradually replacing the old customs, the antiquated machinery, and the one-crop system. The results are already reflected in better homes and a more industrious and cheerful people.

The city of Quincy, county seat of Gadsden county, is in northwestern Florida, in that narrow strip of land lying just south of Georgia. It is in the heart of the famous Sumatra tobacco district, the product of whose plantations scored 20 points higher at Paris than the leaf from the island of Sumatra. Recently I spent a day driving over the

plantations of the Owl Commercial Company and Schroeder & Arquimbau, two of the largest planters in the state.

The Sumatra plant requires special soil, cultivation, and irrigation to bring it to perfection, and the success of the planters in Gadsden county has not been achieved without the most careful study of the plant's needs, and long and patient experimenting with soils and fertilizers. The plant also requires protection from the direct rays of the sun; hence these large plantations are covered with framework over which are stretched millions of yards of cheese cloth, or over which miles of narrow slats have been placed. The soil is prepared with utmost care. Twenty-six wagon-loads of stable manure and one and one-half tons of cotton-seed meal per acre are thoroughly mixed with the soil. The plants are grown from the seed, which is usually planted in a small clearing in a swamp, and under cheese cloth. As soon as they have reached the size of young cabbage plants they are transplanted.

The young plants are carried in baskets by women or children, who follow the men down the rows. With a sharp-



Courtesy Bureau of Soils
PLANTS GROWN UNDER SHADE APPROACHING MATURITY.



Courtesy Bureau of Soils
SHADE GROWN TOBACCO AFTER SEVERAL PRUNINGS.

poined stick the planter makes a hole about 4 inches deep, into which he places the plant, packing the earth about it with a few deft touches. The plants are set about 14 inches apart, the rows being about two feet apart. When the field is equipped with an overhead pipe line with sprays every 33 feet, the plants are irrigated in the evening; otherwise the watering is done with a dipper in the morning. From ten to fourteen thousand plants are set to the acre. As soon as the plants are firmly set a "scooter" is run between the rows, throwing up a flat-bottomed furrow in which the water is run from wooden troughs which divide the field at regular intervals. These troughs are supplied from the reservoirs above the field, or from pipes directly connected with pumping plants on the streams. In the overhead system, now recognized as the most perfect and satisfactory method of artificial watering, two-inch pipes run over the frames in parallel lines about 40 feet apart, extending all over the fields. At intervals of 40 feet a small iron pipe extends upward about 4 feet above the shades, the upper end being closed with a spraying attachment. When the water is turned on in the pipes it comes out of the sprayer in a fine mist and falls like a gentle rain upon the plants. Sumatra tobacco is cultivated constantly, no weeds or grass being permitted to grow in the field. A constant watch is kept to prevent injury from the pests to which the plant is subject. The first of these and probably the worst is the black cut-worm, which working under ground cuts the young plant down near the roots. Should the plant survive this enemy, the planter keeps a lookout for the bud-worm fly, an insect that lays its eggs in the center of the bud and bites a hole in the new leaf not larger than a pin point, but which will be as large as a silver dollar when the plant is full grown. Paris green and corn meal prove effective against this pest, and are applied like common insect powder. When the plant has grown to some height the green horned worm, with insatiable appetite, makes his appearance. He eats a leaf 12 by 24 inches in a single night and still is

not satisfied. The grasshoppers, too, cause much annoyance, and the planters fight them in various ways. When they are very numerous they are rounded up by a large force of laborers and driven out of openings in the sides of the fields. When not too numerous, Guinea fowls are introduced into the fields, and they soon complete the destruction of the hoppers. A Guinea hen in full action after a grasshopper is a sight not soon forgotten, and the insect has but a small show for his life. Boys and girls with wooden flappers go over the fields at regular intervals and aid in the destruction of the hoppers.

Tobacco grows amazingly fast, in some instances attaining 9 feet in 37 days, and the plants must be frequently supported by strings attached to the frames. When the tobacco is gathered it is taken to drying-houses, which are immense barn-like structures with large openings to permit the free passage of the air. When thoroughly dried it comes to the warehouse for sorting into its proper grade. There are 9 grades—light, medium, and dark, with spotted and plain of each of the above. Other grades are called seconds, strippers, fillers, and trash, the latter being the waste after sorting. All the work of sorting and grading is performed by colored women. Children are employed in stripping. For a period of not less than nine months the tobacco goes through a sweating process. Then it is weighed and bulked down. Later the bulks are changed, the center of the package being placed on the outside. Then it is brought to the casing room and moistened. After this it comes to a sorting room, where it is graded by colors. Next it is sent to the tyer's table, where it is tied up after the leaves have been sorted and sized. The packages then go back to the bulk-room, where it goes through a process of drying out. It is then brought back to be sized to the inch, and is put into bales, which are again stored for two weeks or more. The bales are then burlapped, marked according to grade, and shipped.

A fair yield of Sumatra tobacco in Gadsden county is a thousand pounds

to the acre, although it frequently runs as high as fourteen or fifteen hundred. The finest leaf brings as high as \$6 a pound, although the average is probably not more than \$3.50. This

industry requires the investment of large capital, gives employment to a small army of colored people, and has become a strong factor in the material development of Gadsden county.

THE RANGE HOG AS A FOREST PROBLEM

BY

CHARLES H. SHINN,

HEAD RANGER, SIERRA FOREST RESERVE.

IN the lower portions of the California Sierras the officers engaged in caring for and protecting the forest reserves find that droves of half-wild hogs have often been permitted to run at large, more particularly in districts where many oak trees grow. These hogs generally belong to poor settlers who live within the reserves, or who have their homes just outside a reserve, in some small village, either on deeded land or as holders of tracts to which they have not yet perfected titles. Even the richest settler is not apt to own more than a hundred "porkers," and usually the droves consist of from twenty to fifty.

The true "range hog" is remarkably well adapted to his environment. He is a long, lean, tough, strong, fierce, and rough-coated animal, a lineal descendant of the half-wild "razor-back" of western and southwestern literature; but in coming up from the swamps and prairies to the highlands of the Sierras he has acquired even greater size and fighting ability. The solitary old "tuskers" become very savage and picturesque creatures, fit prey for the long boarspear of any huntsman, and capable of fighting off or destroying almost any number of dogs.

Although the regulations bar hogs from these reserves, the swiftness and cunning of the animals is so great, and they are all so much at home in the woods, that it is a difficult matter to follow them up or to keep them out. They will dodge into the thick, thorny shrubs where neither man nor horse can follow

and where dogs dare not attack them, or they will back up between rocks and into gullies, show fight, and charge their pursuers. A mother with her five or six spotted pigs will usually attack anything in sight; and she has need to be fierce, as the forest shelters many coyotes and mountain lions and an occasional lynx.

None of the Sierra forests contains a pure stand of oak, but large areas of it on the western slopes in the reserves below 5,000 feet elevation contain many species of oak, both evergreen and deciduous. The principal species are the Highland Live Oak (*Quercus wislizeni*) and the California White Oak (*Quercus lobata*). These oaks are mixed with pines; first the Gray Pine (*Pinus sabiniana*), the nearly worthless "Digger Pine" of the foothills; then higher up the Bull Pine (*Pinus ponderosa*). Still further up the Digger Pine disappears and the superb Sugar Pine (*Pinus lambertiana*) comes in. But the hog problem is almost altogether one of the thousand feet between the 2,500 and the 3,500 foot levels along the western townships of the California reserves, where the forest consists of oaks, Digger Pine, and Bull Pine.

The injury done by the range hogs in this belt of country is partly to seedling trees and partly to the pasturage. When I came to this (the Sierra Reserve) last November, I observed large areas of soft, rich soil so deeply uprooted that it looked as if it had been freshly spaded. This had been done by bands of range hogs in search of roots



RANGE HOGS IN MIXED FOREST OF OAK AND PINE, SIERRA FOREST RESERVE, CALIFORNIA.

of perennial grasses and of some of our small but nutritious native bulbs, such as the *Brodieas* and the *Calochorti*. The rooting was also deep under many oaks and pines, but at this season, just after the early rains, it was most noticeable in the rich open "flats" and hollows within the reserve. I examined carefully one tract of eighty acres and the following comparative areas were found:

	Acres
Area in fairly good young forest.....	36
Area in poor and fire-injured forest.....	18
Area in heavy growth of shrubs.....	20
Area in scant pasturage and rocky ridges..	30
Area in good pasturage and rich hollows..	9

A drove of not more than thirty hogs had deeply broken the sod on nearly all of the open spaces, and especially over the nine acres of richer soil, so that a fair estimate of their work would be forty-five acres of this one tract examined. By January most of this ground had been rooted over again. In February the drove was taken away, but now, in April, the uprooted places are not grass-grown, but weedy, and the pasturage is undoubtedly much injured.

The pioneers claim that young pine

groves frequently spring up where range hogs have been allowed to work at will, as they root up the close mat of pine needles and give the seed a chance to start. But wherever, in November, December, and January the fresh rooting of these animals had taken place under the pine trees on the eighty acres before alluded to, I found that the seedlings had been entirely destroyed. It seems evident that the burning of the pine needles with the first rains will furnish a better chance for reproduction than any hap-hazard dependence upon range hogs.

Many cattle owners recognize the injury done to perennial grasses by bands of hogs. These grasses were once very abundant, and formed a close mat over large areas; but overstocking has in many places made their growth very "bunchy," under which circumstances the injury done by the hogs is especially manifest. The annual grasses are eaten off, but seldom uprooted.

As far as the settlers themselves are concerned, the habit of turning out their hogs has been in most cases unprofitable and even burdensome. The hogs are

often lost, stolen, or destroyed by wild animals. In any event, they fare badly, suffer greatly in winter, make poor food, and bring but low prices when sold.

When kept in fields, fed and cared for, and especially when "bred up" into better stock, they are one of the best money-makers of the mountain ranch.

Forest officers can justly press this point home to the land owners in and near the reserves, and can refer them to the many and excellent publications upon the care of the hog that have been issued by the U. S. Department of Agri-

culture and by the various experiment stations throughout the country.

As a closing illustration, Mr. Muhley, a settler in this region, tells me that two years ago he bought forty hogs and turned them "out on the range" (in the reserve). When he tried to "round them up" at intervals during the last winter, in order to obey the regulations of the reserve, he was able to find only ten, with no small pigs, and he is now carrying a rifle in order to shoot the two or three hogs that have "run wild" and still stay in the heavy chaparral.

OKLAHOMA IRRIGATION

DESCRIPTION OF METHODS THAT HAVE BROUGHT
SUBSTANTIAL SUCCESS AFTER EARLY FAILURES.—
A PRACTICAL WAY TO FIGHT DROUTH.

BY

A. S. PERRY,

IN THE WESTERN FRUIT GROWER.

IRRIGATION! What is it? You may say it is applying water by artificial means to procure the growth of vegetation during drouth or where the water supply is inadequate. This is partly right, but does not cover the matter by any means. We will not try to describe it in full, but will enlarge on the former definition somewhat. It is the means by which a poor man with only a small outlay can go onto lands that are deemed unfit for tillage, and with only five or ten acres produce profitable employment for a large family, make a pleasant home, and save more money than the average man in an agricultural country will from 160 acres of the best and most valuable lands. It is the only thing that will bring about the beautiful homes that in the future will be seen all over the lands that are now called the arid and semi-arid lands of America. The time will come, and we hope is not far off, when this will be resorted to and 50,000,000 of people will find profitable employment tilling lands that today are supposed to be worthless. Most

likely our government will have to solve the problem and set the stone to rolling.

We will now come down to some of our own experience. First, the writer spent the earlier part of life trying to grow fruit in a semi-arid region without irrigation. This proved unprofitable, as there were as many failures as there were crops. Next, the same work was resumed in another region, which proved no better than the first, so far as rain was concerned. After three years of total failure with small fruits we found ourselves with an empty pocket-book and a debt of \$950 hanging on our word and honor to pay, with nothing more to secure it than 160 acres of land that belonged to Uncle Sam, on which we had placed a filing for homestead entry. This was poor upland and very sandy. Under these circumstances, the conclusion was arrived at that one of three things had to be done: We must irrigate, emigrate, or quit the business of growing nursery stock and small fruit for market.

We decided to irrigate. An old wind-

mill was bought on our promise to pay \$12.50 within three months. Testing showed that sheet water existed at a depth of 14 to 20 feet in the coarse sand. A well was dug and a large amount of water procured; a pump that should have thrown 7,000 gallons per hour would not keep the water off the diggers while finishing the well and walling the same. Success was crowning our efforts. Next a reservoir was built, 100 feet in diameter, the walls being a complete circle and 4 feet high. This was soon filled from the work of the never-tiring windmill. The pond was too small, but work could not be resumed until we had rain, as we needed every drop of the water. As soon as rain relieved us we turned the water out of the reservoir and dug it from the inside until we had the banks 7 feet high. This again proved too small, and another

reservoir was attached to it on the rear from the well, with walls 7 feet high and 300 feet long, making another pond 100 feet square, the first pond forming one side.

The following winter the third pond was dug, still to the rear of the second and of the same size. The need of so many ponds was to preserve all the water that could be pumped during the winter or when the rain relieved the irrigating. The mill can thus be kept running all the time, whether wet or dry weather. By having so much water stored we are able to handle 40 acres of nursery stock and keep it growing during the severest drouth. These ponds were made to hold like jugs (except from evaporation) by puddling one hour per day for two weeks. This was done by using a drag to stir the mud. Stirring the water keeps it muddy, and the



TYPICAL WINDMILL AND RESERVOIR FOR IRRIGATION.

mud settling stops the pores of the soil, which will soon become impervious to water and seepage will stop. This will work on any clay soil.

Our next experiment was on another part of the field where no clay subsoil existed. Eighteen inches of sandy soil covered a bed of almost pure sand, which extended fifteen feet. Here a reservoir was built 200 feet long and 100 feet wide. The same method of puddling was resorted to, but not enough water could be held in the pond to make it a success; besides, the bottom was so soft that a horse would mire in it like quicksand. A fence was put around the pond inside of the banks and twenty-one head of hogs procured and placed in the pen. No shade was provided for them, but the mill was steadily pouring a stream of cold water in the pond, so it was "root hog or die" with the heat. The hogs rooted and the water raised, and in a short time we were using water from this pond for our plants, the result being that the bottom was as solid as either of the ponds on clay.

The results of three years of inexperienced work with the water had given us means to build the ponds mentioned and to procure windmills and pumps adapted to the work and save some money to enlarge our business with. Now we felt that we had a "down-hill pull" and commenced enlarging our nursery planting and small fruit blocks. Two acres of strawberries were set, and the first crop gave us the neat sum of \$315 per acre above paying for picking, crating, and express charges. We also planted raspberries and blackberries; the former proved unsuccessful on account of soil being too light, but fine tip plants were secured and have since proved a source of good revenue, as other nurserymen cannot raise them in this part of the country without water. The blackberries pay \$200 to \$225 per acre above picking and crating. The cost of cultivating and irrigating being about \$30 per acre, leaves a good margin on the right side for the grower. Strawberries cost a little more, about \$50 per acre per annum. You may say, "Doesn't that vary with the amount of rain?"

It does. The less rain we have, the less the cost, for if there is not much rain the weeds do not get the start of you, for you irrigate, and before the weeds have time to germinate, the plow has dislocated and destroyed them, while with the rain the whole field is on you at once, and thus gets the start and costs more to clean it up than the cost of irrigation.

Another successful year has passed and we have paid the debt of \$950, with 12 per cent interest. After closing out our salable plants, we are pleased to find that we still have money to further enlarge our planting of berries and nursery stock. The following year we grow stock under contract for nurserymen that want to be sure of getting fine stock. This we can assure them, for they will not suffer from drouth. The fall of 1900 arrives and we are loaded with a fine supply of extra fine stock for the planter, as well as having turned about \$2,000 worth of fruit into cash. A fair price prevailed on the nursery stock, and after selling it out, which was an easy matter, as all our customers by this time had learned that our stock is exceptionally fine on account of having water for it, the profits of a year's work were at once put into a farm lying on the bank of the North Canadian River. About forty acres of this is in ideal shape for irrigation without much grading. A twelve-horse power gasoline engine and centrifugal pump, which is giving us 1,000 gallons per minute, was installed, and the land planted in berries and potatoes. Potatoes are yielding 250 to 300 bushels per acre, and at this time are bringing \$1.25 per bushel. The price for the entire crop will average about 80 cents per bushel. The berries now are in fine condition and will be in shape for a large crop next spring, whereas, without irrigation, there would be nothing alive at this time, after the prolonged drouth we have suffered, and which is not yet broken.

The cost of running our engine is within a few cents of \$2 per ten hours run, and enough water will be thrown to cover ten acres 1½ inches deep after allowing the usual one-third for loss in ditches.

THE REDWOOD,

CALIFORNIA'S MOST VALUABLE TIMBER
TREE, WHOSE MANY UNIQUE QUALITIES
GIVE IT A WIDE RANGE OF USEFULNESS.

ARDENT believers in the excellence of Redwood lumber have ascribed to it so many worthy properties that many persons, and especially easterners, accept many statements concerning it with a grain of salt. Perhaps this may account for the comparative infrequency of its use except in the neighborhood of its growth, though it is more likely that high freight rates have a great deal to do with its lack of use in the eastern United States. It has been stated that the wood makes excellent fuel, and that it is fireproof; that it is the lightest wood that can safely be used in building, and that it is so heavy that it will sink in water; that it can be cut and worked easier than White Pine, and that it is so hard it will turn the edge of a steel tool.

These very apparent inconsistencies may be reconciled in some degree by a slight modification of the statements. Clear Redwood is at once light, easy to work, soft, and straight-grained. Redwood burls, or knotty excrescences put forth by the tree to heal a hurt, are heavy enough to sink in water, and hard and tough enough to daunt an edged tool. They are, when properly worked, very beautiful, being susceptible of a high polish, which, with their rich red color, makes them like mahogany in finish and curly maple in texture. As for being fireproof, it can be said that the absence of resinous gums makes the wood fairly fire resistant, and that cases have been known in San Francisco, which is built mainly of Redwood, where a party wall of that material has offered an efficient check to the spread of a conflagration. Moreover, the fire record of San Francisco, essentially a wooden city, whose hills and high winds make many difficulties for the local fire department, show that there has been an immunity from serious fires not enjoyed by any other city in which the

use of wood for building purposes has been so general.

Redwood is unique not only in its lumber qualities, but in its manner of growth, distribution, and other silvicultural characteristics, all of which have been brought out in a bulletin recently published by the Bureau of Forestry. This publication makes a careful study of the tree, its methods of reproduction, and goes into the question of applying the principles of forestry to lumbering operations in the California Redwood groves. Also it treats of the fungus growths which attack the tree, and the insect enemies, finding in both these latter cases that the Redwood is singularly immune from depredations which work havoc among many other woods.

The Bureau of Forestry sought to find out whether there would be profit in holding cut-over lands for future crops, and going to the expense of protecting the young growth in lumbering operations and from fires. It has been stated, and believed even by those who live among these trees, that the Redwood represents what an Irishman might call "an extinct living species," and that efforts toward its reproduction would be futile, as conditions under which the trees started, one thousand or more years ago, no longer exist. To most any observing person it is apparent that this idea is an absurdity. The old giants among the Redwoods are bound to be cut, except in a few places where they may be preserved in parks, for the simple reason that it is profitable to lumber them, and future generations of these trees will never attain the size of the patriarchs of the virgin forest because the sawmill man cannot afford to wait that long; but it has been demonstrated by Mr. R. T. Fisher, of the Bureau of Forestry, that Redwood reproduces itself abundantly

by sprouts and occasionally by seed, and that in thirty years under fair conditions it should yield 2,000 feet B. M. to the acre.

It is inevitable that the old forests will be lumbered, but that need not mean total destruction, which is apt to follow the wasteful methods now in use. The Mendocino Lumber Company, operating in Mendocino county, California, has done a great deal toward the adoption of a rational Redwood forest management, and has secured excellent growths on its cut-over lands, which, had they been lumbered in the usual careless manner, would have been worthless at this time.

The ordinary Redwood (*Sequoia sempervirens*) and the Big Tree (*Sequoia washingtoniana*) are distinct species, though their lumber is called by the same name. Comparatively little lumber comes from the latter, as it occurs only in scattering bodies and not accessible to markets. Moreover, most of the Big Trees are preserved and their destruction is now hedged about with much sentiment.

The commercial Redwood grows to a greater height than any other American tree, though it is exceeded in girth and age by the Big Tree. The best specimens are 350 feet high and 20 feet in diameter. Most of those being cut at present are upwards of 500 years old, the oldest being about 1,375 years. When normal the tree has a straight, slightly

tapered bole, clear for 100 feet or more, with a crown of comparatively short horizontal branches, which occupy from one-half to one-third of the total length. It has no taproot, but the other roots strike downward at a sharp angle, forming a compact woody mass, well adapted to securing water. The bark forms a remarkable resistant to fire and



VIRGIN REDWOOD, SOUTH FORK OF EEL RIVER, CALIFORNIA. THE TREE AT ITS BEST.

thoroughly protects the older trees from any flames which may go through the forest. The normal is not the common form, as the tree assumes a variety of shapes, depending on local conditions, and in some cases the crown is a few flat limbs near the top on one side, or perhaps a thick mass of little bushy branches extending from the ground to

the top of the tree. Many trees have burls on the trunk 10 feet long, and some carry curious protuberances, called "hanging necks." These deformities are caused, in most cases, by the efforts of the tree to heal its hurts.

The tree requires apparently only that the soil be moist, and the best specimens are found where a canyon or arroyo assures considerable seepage or where creek bottoms afford an abundant supply of water. The moisture of the soil affects the development of the Redwood, but the moisture of the air affects its range and regulates its distribution, for

comes from trees which have grown in the bottoms or "flats" under favorable conditions. "Flinty" timber is more apt to be found on the slopes, and the tree's vitality is so great and it endures so many vicissitudes, all of which leave their record, that the grain of the wood bears a direct relation to the eventfulness of its life. These differing conditions of the lumber give rise to such varying statements as are quoted in the first part of this article.

The Redwood forest itself is of the selection type, and contains trees of a wide range of age in a single mixture,

but, contrary to the usual selection for est, the large, mature trees outnumber the small ones. Sucker and seedling share in the reproduction, but unequally, in a ratio of about 100 to 1. The germination quality of the seed is poor; so also are the opportunities for germinating, as the seed requires considerable light, and the suckers crowd the seedlings out, even when germination takes place. In some places of the forest a ray of sunlight never penetrates. The crown of the Redwood is, nevertheless,



REDWOOD SPROUTS 6 TO 8 YEARS OLD, CRESCENT CITY.

the tree is found only where the heavy fogs from the Pacific sweep inland to the crests of the western slopes of the Coast Range, and east of the coast mountains none are found except such few scattering and lonely sentinels as that one which stands on the Stanford University estate, and gave the name "Palo Alto," or "high stick," to the university town. Eastern and southern slopes, where the sun is hot and the sea mists strike only occasionally, show few Redwoods, and these are short and limby.

As stated above, the quality of the wood varies. The softest and best

less, almost as thin and open as that of the Larch, and in a mixed stand the Redwood's branches die off more rapidly than those of its companions, and the crown bends eagerly to those places where the light enters the forest canopy; yet the young trees, suckers from mature roots, grow under shade that would kill seedlings and survive year after year until they get more light, perhaps from the felling of the parent tree, when they shoot up with vigor. In some places the new growth grows in clumps as white as potato sprouts in a dark cellar. Under any conditions the shoots of one season's

growth are as soft and juicy as young asparagus.

The enemies of the Redwood are few, and the tree suffers little from them. Wind seldom damages it. Even fire, the greatest enemy of all, though it has for centuries run through these forests, has had comparatively small effect. Underbrush and young trees are killed, but the thick bark protects the old trees. In cut-over lands, however, the damage from this source is great. Dr. Hermann von Schrenk has found that fungus attacks it but seldom, and then does but little injury.

A brown rot does some damage at the base of trees, but does not affect them for any great length, and the tree's remarkable immunity from forms of decay has enabled it to reach such a great age. Dr. A. D. Hopkins finds that the insect enemies are few in number and insignificant in their damage, being held in check by parasites in great measure, and for the most part preferring other trees in the same neighborhood to the Redwood.

It remains, then, to be said that man is the greatest enemy these forests have.

Even now, with the growing demand for the tree and the awakening appreciation of its uses, lumbering operations are carried on with a small margin of profit, as the methods have to be on a gigantic scale, from the size of the tree and the trouble in getting the lumber to market. Steam is used throughout the process of lumbering, and the fall of a tree not only destroys everything within its path of 250 feet, but in most cases splinters the tree itself, so that all of the crown and a large portion of the bole is a shattered and tangled wreck. At least a quarter of the stand is a total loss, and is, moreover, a source of con-

siderable trouble and expense. Logs are peeled and the bark and branches set on fire. Then the yarding crew, with donkey-engine and tackle, gets the log under way for the mill, and as it goes plunging and plowing along hardly a tree in its vicinity is left uninjured.

If reasonable care were exercised there would be a much better chance for good stands of second growth Redwood, which is valuable timber at 45 years old, and while the virgin stands are yielding from 20,000 to 150,000



SECOND GROWTH REDWOOD AT MENDOCINO, 40 TO 45 YEARS. THE YOUNGER GROWTH FORMS A RING AROUND THE PARENT TREE.

board feet per acre, the cut-over lands in the number of years specified should yield at least 3,000. And with the future which Redwood assuredly has, this would be a profitable holding. In Sonoma county trees are now cut to a diameter of 10 inches at a profit, and they grow to this size in from 20 to 25 years.

The uses for Redwood are growing. Its resistance to fire has been noted, and, as stated, insects seldom injure it. In sea water and in moist places generally it resists decay, but the marine teredo destroys Redwood piling as readily as any other. At present the market is



REDWOOD FLAT, CRESCENT CITY. CHARACTERISTIC GROWTH ON LEVEL GROUND.



BROWN ROT OF REDWOOD. POCKETS OF DISEASED WOOD ON LOG PARTLY SUBMERGED IN A STREAM.

limited, for all practical purposes, to California, although occasional cargoes go to the Orient, where it should become popular, since exhaustive tests prove it immune to attacks of the destructive white ant or termite. At home it is useful for all kinds of finishing and construction lumber. Many of the finest houses throughout California are built of Redwood and shingled with it. In addition, all of the interior work, including solid panels for wainscoted walls and ceilings, is made of the wood, which takes either a high polish or a more popular soft, oiled finish. For shingles, railroad ties, electric-light poles, paving blocks, tanks, and pipe-staves it is an excellent wood. Contact with the ground and with moisture affect it but little, and miles of banded pipes of Redwood staves are used in irrigation works on the Pacific coast.

In conclusion it may be said that there are good chances for forest management among the Redwoods, but that the narrow profits of the lumbering make the simplest and most inexpensive methods the best. The Mendocino

Lumber Company has operated with an eye to the future, and as they have cut no trees under 20 inches and spared the young trees in their operations as far as possible, the hills where they operate are well wooded, with a thick enough stand to insure clear trunks and a consequent lessening of the danger from fire, in contrast to the usual system of laying bare the land. The result of this case has been in every way worth the trouble and the land is becoming more and more valuable instead of being a rain-washed and fire-devastated waste. The example set by this company is very much to the point, its methods being cheap and practical. Other companies may find more care necessary to keep fires out of the young growth if they start forest methods now, and everything will have to be done with a sharp eye to the cost. But under the average prevailing conditions the whole Redwood country from Oregon to Monterey Bay can be made to perpetuate itself in timber and regain much of its original value.

PRACTICAL HELPS FOR IRRIGATORS.

CONSTRUCTING A RESERVOIR—SUCCESSFUL PUMPING PLANT—AMOUNT OF WATER REQUIRED FOR IRRIGATION.

Directions for Building an Earthen Reservoir.

A COMPETENT irrigation engineer has furnished the following directions for constructing a reservoir of substantial size by building a bank of earth across a natural ravine to receive and impound waters.

Such a bank should be founded upon solid homogeneous earth, containing at least a considerable percentage of clay, so as to be practically impervious to water under considerable pressure. The site of the foundation should be cleared of all vegetable matter, and should be left rough by plowing several furrows across the ravine lengthwise of the proposed bank, so that a good bond can be made between the foundation and the embankment. The bank should be of

earth, free from roots or other vegetable matter, and preferably a mixture of clay, sand, and gravel. Not more than two-thirds of its bulk should be of any one of these materials. It may be put in place by means of scrapers, and should be kept damp, so that it will pack well. This can be done by means of a hose or sprinkling cart.

In the course of construction the bank should be thoroughly compacted by teams or rolling. The men and teams handling the scrapers are valuable for this purpose, but should be supplemented by something else. A herd of cattle or sheep might be driven back and forth or herded on the embankment, or rollers may be used; but these should be

corrugated, so as not to leave a smooth surface. The slope of the embankment should be about 3 to 1 on the water side and 2 to 1 on the lower side, and the top width should be not less than 5 to 10 feet.

An ample spillway should be provided in some location where the waste waters may be discharged without injury to the dam, and should be of such a capacity as to discharge the highest flood to which the drainage basin is subject, without danger of overflowing the dam.

Provision for drawing off the water may consist of a cast-iron pipe in the bottom of the ravine under the dam, with the earth carefully puddled and packed around it on all sides to prevent percolation along the pipe. It would be still better to lay the pipe wholly or partly in a bed of concrete, as this can be tightly bonded with the earth. The pipe, of course, would be provided with suitable valves for opening or closing the outlet.

In regard to the flow which the

ditches should have, this depends upon many factors. The most important of these factors is the quantity of water which it is intended to carry. The following is a table which may be of use. The slope, as stated, is the least allowable for each case, and a somewhat greater slope would be better, but it should not be very much greater.

Discharge.	Depth.	Bed-width.	Slope.
<i>Sec. ft.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet per mile.</i>
3	1	1	10
5	1	2	8
5	1	3	5
15	2	2	4
20	2	3	5

The column marked "bed-width" means the bottom of the ditch. It is assumed that the side slopes will be $1\frac{1}{2}$ horizontal to 1 vertical; the discharge is given in cubic feet per second, and one cubic foot per second is equal to 450 gallons per minute.

Pumping Water for Irrigation.

Mr. A. B. Fowler, of Guernsey, Wyoming, writes that he has a pumping plant belonging to Mr. E. F. Hurdle and himself, consisting of a second-hand 70-horse power boiler and 50-horse power engine, costing \$1,500 in place. The running expenses amount to \$5 per day for labor and fuel. By means of it 7 cubic feet of water per second are raised to a height of 20 feet. This amount of water irrigates one acre per hour of crops planted in rows, and one-half an acre per hour when used in flooding. The pump is estimated to furnish sufficient water for 500 acres in diversified

crops, but up to the present the engine has not been operated for more than one-third of the time in any season, as yet only about 200 acres of land being under cultivation.

This device has been an unqualified success, and would be in any other similar locality where an abundance of water can be had. For such a plant to be profitable it is necessary to have a good market for the crops raised, or plenty of live stock to feed. It is probable, however, that water is obtained in this way as cheaply as can be had through ditches.

Amount of Water Required to Irrigate an Acre.

A cubic foot per second flowing through an irrigation season of one hundred days will deliver about 200 acre-feet, or will cover 100 acres 2 feet in depth. In most localities this is sufficient water for the production of an average crop. In California, where water is scarce, less is used, and for

orchards twice as large an area can be irrigated.

When irrigation is first practiced more water is needed to thoroughly wet the subsoil, but after a few years a less quantity is required, and in some localities, as at Fresno, California, no water is applied on the surface, the seepage

from the canals keeping the fields sufficiently moist.

Two acre-feet for an acre is an average allowance for the arid region as a whole.

Five acres per miner's inch, or 250 acres per second-foot, may be taken as the most economical use, say at River-

side and Redlands; where ditches are lined, water is carefully measured, and citrus fruits are irrigated. This must be furnished about two hundred days on an average. It is equivalent to $1\frac{3}{4}$ acre-feet of water per acre irrigated. This duty can be improved by the use of pipes.

THE LOCUST.

DESCRIPTION OF THE RANGE, HABITS, AND METHODS FOR PLANTING ONE OF AMERICA'S MOST VALUABLE TIMBER TREES.

BY

WILLIAM L. HALL,

CHIEF OF DIVISION OF FOREST EXTENSION, BUREAU OF FORESTRY.

THE Locust (locally known as Yellow or Black) (*Robinia pseudacacia*), originally indigenous to the mountainous region from Pennsylvania to Georgia, and possibly as far west as Arkansas and eastern Indian Territory, is now widely naturalized, through cultivation and other agencies, throughout the United States east of the Rocky Mountains. Of recent years it is appearing in great abundance on abandoned hillside farms of Pennsylvania, Ohio, and Kentucky, and is also increasing in the southern portion of the plains region west of the Mississippi. It rarely forms extensive pure growths except in southern Pennsylvania, Ohio, and eastern Kentucky, where it is most abundant. Even in these localities it is usually associated with other deciduous trees, occurring in small scattered groves.

It has been more or less employed as an ornamental tree and considerably planted in the Middle West for economic purposes. Its tendency to sprout from the root and its frequent failure through the attack of borers have brought it into disrepute in many sections. However, these drawbacks are not general and where present can, to some extent, be obviated by proper methods of management.

The range for planting the Locust is extensive, covering the region between

the Appalachian Mountains and the Mississippi River, and extending west of the Mississippi south of the 38th standard parallel as far as the Rocky Mountains. It is also well adapted to the valleys of Utah, Idaho, and eastern Oregon and Washington if planted on irrigated land. The planted groves to be seen near Salt Lake City, Utah, and Walla Walla, Wash., are among the best in the United States.

The growth of the Locust is very rapid, especially in rich soil, where during its early growth it makes an average annual increase of 2 to 4 feet in height and $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. After the first 25 or 30 years the average accretion, both in height and diameter, lessens, and by the fiftieth year usually almost ceases. When the tree is once established, it sprouts vigorously from the root, so that coppice growth is easily maintained. The trees usually attain a height of 40 to 80 feet, with a diameter of 2 to 3 feet.

The largest and best Locust trees are generally found in well-drained, deep clayey, lowland soil, but it grows successfully on sandy and gravelly soils, and is said to produce more durable timber there than in better situations. On wet soils it is of slow growth and short-lived. Its roots are shallow, and where the soil is poor reach out to great distances to obtain nutriment. The

habit of shallow rooting is in part accountable for its sprouting tendency as well as for its rapidity of growth and its adaptability to soils underlain by tenacious subsoil. With favorable soil conditions, Locust trees grow almost as well on slopes and hillsides as on level land.

The timber of the Locust has found extensive use as fence posts, ribs of vessels, tree-nails, telegraphic insulator

and pruned while young it will produce straight poles 18 to 20 feet long.

It is most commonly used for fence posts, for which purpose it is extensively grown. The ease with which it is handled, its rapid growth while young, and its ability to endure extremes of heat and drouth add to its usefulness for this purpose. A post of 4 to 5 inches in diameter can be produced on good soil in 7 or 8 years, and when used



BLACK LOCUST FOREST PLANTATION, 12 YEARS OLD, IN MEADE COUNTY, KANSAS.
TREES 6 TO 8 INCHES IN DIAMETER AND 30 FEET HIGH.

shanks, and in the manufacture of vehicles. It also has been used somewhat for railroad ties and telegraph poles. Its great durability in contact with the soil makes it very valuable for use in the ground, and its toughness and elasticity adapt it to use where great strength is required. On account of its tendency to produce a short trunk and numerous branches, it is not well suited for use as telegraph poles and seldom produces one of good length, but if planted thickly

in the ground will last from 8 to 15 years. Unlike many timbers, the young wood is almost as durable in the soil as the old, on account of the large proportion of heartwood.

The Locust is one of the most valuable trees that can be used for planting in Oklahoma and the Indian Territory, where it is seldom attacked by borers, and where it can be grown for fence posts with a profit often exceeding that to be obtained from agricultural crops.

Many farmers and ranchmen have established plantations to supply the posts and poles required in keeping up fences and sheds, in this way saving themselves a very substantial amount annually.

The Locust is propagated easily from root cuttings and from seed. The latter is the most common method. The seed retains its vitality for a number of years if kept in the pods or buried deep in the ground, in the latter case having been known to grow after seven years; but seed out of the pods will not germinate well after two years. The pods ripen about July or August and the seed can be sown immediately, when it will generally come up and make a considerable start the same season; if kept for spring planting it is advisable to keep the seed in moist sand in a cool place during the winter. Old seed and that kept dry over winter is best handled by soaking in warm water for a day or two immediately before planting. The seed when once soaked should not be allowed to dry out, but should be planted immediately while in a moist condition.

The seed should be sown in well-pulverized, rich loam soil in early spring. If hand cultivation is to be given, the seed may be sown in drills 12 to 15 inches apart in a bed, but if horse cultivation is to be practiced, it should be sown in rows $3\frac{1}{2}$ feet apart. The seed should not be covered more than $\frac{1}{2}$ to $\frac{3}{4}$ of an inch deep. A pound contains about 28,000 seed and is sufficient for a row 900 feet long. The seedlings will be large enough to set out in their permanent sites the following spring or fall.

The method of management adopted

in a plantation of Locust largely determines its usefulness and value. Thick planting should be the rule in order to force the tree into straight, tall growth. In most cases 4 by 4 or 3 by 6 feet are suitable distances.

If the trees are planted in a solid block and surrounded by a few closely planted rows of other trees, there will be no difficulty from sprouting. Sprouts do not grow where the ground is shaded.

Every effort should be used to keep the trees in thrifty growth for the first 12 or 15 years. Borers seldom injure the trees that are growing rapidly, but confine their attacks to those of less vigor. If damage from borers is apprehended, the trees should be cut for use before they cease rapid growth. Sprouts from the stumps will at once renew the growth. By this method of cutting, a crop of posts can be produced every 10 or 12 years.

The best success usually results when the Locust is grown mixed with some other heavy-foliaged tree, as its own shade is not dense enough to keep out grass and weeds. As accompanying or nurse trees, the Osage Orange, Russian Mulberry, Hardy Catalpa, and White Elm do well, as they cast heavy shade and do not grow rapidly enough to overtop the Locust. The associate tree need not occupy more than one-third of the spaces in the mixture. The Locust is a good tree to plant with the Black Walnut, where the latter is desired as the permanent stand. The two may be planted alternately in the rows. Within 15 years the Locust may be cut for use as fence posts, leaving the Black Walnut for the final stand.

RECENT FOREST FIRES.

THE CONTINUANCE OF SPRING FIRES CAUSES
IMMENSE DAMAGE IN A NUMBER OF STATES.

THE most severe forest fires of May have extended from Maine and Canada on the northeast, along the region bordering on the St. Lawrence and the Great Lakes, to the forests of Min-

nesota west of Lake Superior. According to press reports received by FORESTRY AND IRRIGATION, not one of the New England States was exempt from fires during the past month, and at the

time of going to press the most serious fires in New York and Pennsylvania were still burning.

Maine.—May 5 a forest fire endangered the town of Kennebunk, but was fought off successfully by a force of railroad men and citizens. It burned over an area of 1,000 acres and destroyed property valued at \$13,000. The flames started from sparks from a locomotive on the Boston and Maine Railroad. On the same date large tracts in the neighborhood of Bemis and Houghton were burned over and the Brimstone camps of the Berlin Lumber Company were destroyed. The mill of the International Lumber Company at Bemis was threatened, but a large force of men, gathered from nearby camps, got the fire under control. The loss here was mainly in the standing timber, and was started from brush fires. A fire at the same time in the neighborhood of Ellsworth and Lamoine threatened the latter town, which was saved only by hard work after several houses and barns on the outskirts had been consumed. Lumber camps were destroyed. This fire again broke out with increased vigor a week later, after it had been supposedly checked. On May 12 severe fires were raging in Washington, Hancock, and Penobscot counties, burning over vast areas and threatening the mills of the Great Northern Paper Company at Milinocket. The fire was successfully fought at this point by a force of 300 men. Greenville, just south of Moosehead Lake, was threatened by a fire started from burning brush. These Maine fires were in no sense different parts of the same burned area, but were distributed through four widely separated parts of the state.

New Hampshire.—A fire which might have had some relation to that which threatened Bemis, Me., near the Rangeley Lakes, was reported as burning in New Hampshire on May 2, denuding the mountains and sweeping thousands of acres near the northern border of the state. May 15 rain checked forest fires along the Connecticut River between Stratford and Lancaster. The northern parts of Vermont and New Hampshire have not been so thoroughly fire-swept

in years, the loss aggregating at least \$700,000.

Massachusetts.—Hundreds of acres in Worcester county were swept by forest fires about May 1. The owners of woodlots have been the principal sufferers, and the fires are supposed to have originated in the careless burning of brush. On May 14 serious fires were reported from the western portion of the Cape Cod peninsula in the neighborhood of Sandwich, and threatening that village. A strong southerly wind carried the flames from a portion of the woods which were burned over a few years ago to the more thickly grown tracts, and spread so rapidly that the fire wardens were unable to cope with it. A magnificent summer home on the shore of Spectacle Lake was burned, and deer, fleeing before the flames, sought refuge in the lake.

Rhode Island.—Heavy losses have been reported from this state and from Connecticut, the light rainfall during April making the ground and underbrush very dry. No details are obtainable, but the principal losers are owners of woodlands.

New York.—The most destructive fire which has visited the Adirondack region in years burned from April 30 to the middle of May, and did great damage to standing timber and to buildings. Driven by a high wind, the forests were devastated in the neighborhood of Lake Placid and Loon Lake, and for more than 100 miles along the lines of the Delaware and Hudson and New York Central railways. The woods were dry as tinder, and it is supposed that the flames started from the sparks from a locomotive. Thousands of cords of pulp wood and hundreds of cords of charcoal were destroyed when the fire first started. Dwellings were burned at Plumadore, a summer cottage was destroyed at Lake Placid, and the big hotels there seriously threatened. On May 5, after a slight check, there was a fresh outbreak on the northern slopes of the Adirondacks, and near Everton a boy was burned to death. The paper-making village of Newton Falls was saved by fierce, persistent fighting, in which the fire companies of nearby villages lent

their aid. So great was the danger that all of the women and children were taken away by train. Many families in this region were rendered homeless, and some escaped only when driven into the Oswegatchie River. Rain and heavy snow checked the fire in the neighborhood of Cranberry Lake.

On May 11 these fires, which were believed to have been effectually extinguished, broke out again with increased fury, and, driven by high winds, threatened Benson Mines, which had suffered some loss in the previous fires. The damage from this series of fires cannot be estimated, and details of the destruction were meager in all cases, as the telegraph and telephone lines were destroyed. Thousands of acres are known to have been burned over, and in many places the country is cleared of all vegetation. May 2 a fire broke out in the mountains around the military reservation at West Point, and the Yale forest students who are working on the government tracts tried to check it. The entire battalion of cadets was called out to fight the fire and succeeded in stopping the advance of the flames toward the Military Academy's buildings. Considerable damage was done to timber on government property.

Forest fires on two sides of Port Jervis, Orange county, May 2 threatened the town with destruction, especially as the men were all away. The women of the town organized a bucket brigade and saved the village property adjacent to the fire. Several thousand acres on the estate of George Chapin, near Lebanon Lake, Sullivan county, were burned over at the same time, deer, antelope, and other game being destroyed. This fire is said to have been of incendiary origin, and Mr. Chapin offered a reward of \$2,000 for the apprehension of the person who started it. It is known also that the extensive Adirondack fires were in some instances deliberately and maliciously started, and that as soon as one was extinguished another was kindled. In one instance a twelve-year-old boy set fire to the woods in several places, even after he had been apprehended starting one fire which almost resulted

in loss of life. May 20 the Adirondack fires were gaining headway so rapidly that it was predicted nothing short of a deluge of rain could prevent the absolute laying waste to three counties, with unprecedented losses. May 25 the fires were said to be under control.

Pennsylvania.—From May 10 to 14 fires burned over wide areas in Pennsylvania, devastating the country around Altoona, between that city and Johnstown, and west of the latter place in the Laurel and Chestnut ridges. For sixty hours lumbermen and mountaineers fought the flames without a rest and managed to save the villages of Dunlo, Vintondale, and Twin Rocks, which were in imminent danger. Houses were destroyed in Westmoreland county, and timbered tracts in Cambria and Somerset counties were burned over, involving the destruction of much standing and sawed timber. Near Bradford, on the northern boundary of the state, fires again broke out on May 13, after \$1,000,000 worth of property had been destroyed by fires on April 30. Here the greatest trouble was to divert the flames from oil wells. Near Ormsby fifty oil rigs were burned and a family is missing. It is feared that the members perished.

Maryland.—Fires around Cumberland, May 2, destroyed several square miles of standing timber, the loss from this source alone in one small area amounting to \$20,000. Many small buildings, much fencing, lumber, ties, and cordwood were also destroyed.

Virginia.—A mountain forest fire in the southwestern part of Frederick county, near Winchester, burned May 1 and 2, destroying 4,000 acres of valuable timber and 20,000 panels of fence. Two large residences with their barns and outbuildings were burned, and the losses from these amounted to many thousands of dollars.

Michigan.—Fires were raging all through the northern part of the Michigan peninsula from April 27 to May 1. These were reported in the last issue of *FORESTRY AND IRRIGATION*, though the extent of the loss was not then known. Since those reports additional details have shown that many buildings

were destroyed, and that the fires were general through a wider region than at first supposed, as there is hardly a town of that part of the state which did not report serious destruction in its immediate vicinity.

Wisconsin.—The fires in the neighborhood of Ashland, which started April 27, were reported in our last issue. The little town of Kimball was destroyed, with considerable lumber, some of it on cars. Fires of some magnitude spread through the woods along Lake Superior between the Michigan and Minnesota boundaries, but were fortunately arrested by a heavy downpour of rain. From Appleton, under date of May 6, there have been reports of earlier and more serious spring fires than usual, most of them being confined to hardwoods; pulp and pine wood suffered but little. In a large part of the territory where the fires burned, the snow was still on the ground, and this fact aided in quelling the flames more rapidly than is generally the case.

Minnesota.—Fire ran through about 9,000,000 feet of down timber on the

Cass Lake Indian Reservation on May 1. This timber was blown down last fall, and it was recommended at that time that the pine be cut and the money go into the Chippewa Indian fund; but the work was not done last fall, though it was stated that it was to have been started within a week of the date when the fire started. Besides lying in the snow, the lumber suffered greatly from this fire, and thousands of dollars have been lost to the Indians.

Canada.—Fires on both sides of the St. Lawrence River, in Quebec and Ontario provinces, were reported as burning from April 30 to May 7, destroying many thousands of cords of pulpwood, much standing timber, and a few small settlements. The Laurentian region, north of Montreal, suffered severely, people abandoning farms and animals in their efforts to escape. The little village of Morrison was wiped out and a Canadian Pacific train only got through by going at full speed, and even then the cars were scorched. Part of the country north of Lake Superior was also in flames at that time.

RECENT PUBLICATIONS.

Any of these books will be sent by the publishers of "Forestry and Irrigation," postpaid, to any address on receipt of the published price, with postage added when the price is marked "net."

Grundriss der Wildbachverbauung. Volume II.

By FERDINAND WANG. Published by S. Hirzel, Leipzig. Price, 16 marks.

The wars and other political disturbances of the 17th and 18th centuries wrought great havoc in the forests in the mountains of southern Europe. The population became very impoverished and a wholesale destruction of the forests went on from year to year until great regions in the Pyrenees, the French, Austrian, and German Alps, and the mountains of Italy and of Bohemia became the scenes of annual floods and terrible erosions, landslides, and avalanches. Early in the 19th century the situation became so serious that the prevention of such disasters became a national policy. Millions were spent in the correction of streams and reforestation. In many places the work was almost in vain, but on the whole patient steady labor was, at a great price, rewarded with success. At present the systems applied have become scientific enough to allow of incorporation into a general text-book.

The work of Ferdinand Wang in two volumes is such a hand-book, and is a com-

pilation of all the experience gained by engineers and foresters in Europe during the last century. The first volume deals with the theoretical part of the discussion, the effect of forests in the regulation of drainage and the consequent results of deforestation in mountainous districts. Unfortunately this volume is not available at present. The second volume is entirely technical and deals with the methods of correcting wild torrents in the mountains, of preventing avalanches and rolling stones by protection forests, and of erosions by correcting the water flow and reforestation. These subjects are treated in detail, and the text is elucidated by a great number of plates and figures. The section on protection forests and on erosions is particularly interesting. Many instructive pictures show the various stages of the process of founding protection forests and preventing serious erosions. The work seems to have been done with great speed, and, as the pictures show, with complete success.

A very large section of the book is given up to a detailed description of tree planting on high mountains and eroded areas. A great

number of diagrams are used and the various methods given at considerable length. The book closes with a historical sketch of the work in each European country, and in Japan, thus finishing an exhaustive treatise on all the phases of European water regulation and reforestation in mountainous territory.

Although it suggests far too elaborate methods for our conditions, the two volumes should be of great value in the solving of similar problems in America. This particularly applies to the management of protection forests and the correction of erosion. Some of the pictures in these subjects show exactly the same conditions as those in America, and adaptations of the preventive measures there suggested would undoubtedly be of practical use.

W. F. HUBBARD.

Handbook of Climatology. By Dr. JULIUS HANN, Professor of Cosmical Physics in the University of Vienna and editor *Meteorologische Zeitschrift*. Translated, with the author's permission, from the second revised and enlarged German edition, with additional references and notes by R. De C. Ward, Assistant Professor of Climatology, Harvard University. The Macmillan Company, New York. 1903. Pp. 437. Price, \$3.00 net.

Professor Ward gives us not merely a translation of this admirable work, but a volume that contains many additions and improvements, with a view of adapting it to American needs.

The work is especially rich in references. Nearly every page contains a number of footnotes suggesting where the student may go for further information. Chapter XI is devoted to the "Influence of Forests on Climate." While the author does not treat the subject exhaustively, he presents an excellent summary of the present state of knowledge on the subject.

The book is timely and well in advance of present text-books on climatology.

Wood: A Manual of the Natural History and Industrial Applications of the Timbers of Commerce. By G. S. BOULGER, F. L. S., F. G. S., F. R. H. S., A. S. I., Professor of Botany and Lecturer on Forestry in the City of London College, and formerly in the Royal Agricultural College. Pp. 369. Illustrated. London: Edward Arnold. New York: Longmans, Green & Co., 1902. Price, \$2.60.

The author does not claim perfect accuracy or completeness for this work; it is rather a compilation of the most important facts relating to the subject and a collection of statistics gathered from various parts of the world. Originality is neither expected nor desirable.

In part I the origin, structure, development, classification, defects, durability, and uses of wood are discussed. The classification is merely a general one, and is based both on general appearance and microscopic structure, and the chapter on defects is an exceedingly

brief one, of no great practical value to American students. The uses of wood are described in twenty pages. In the chapter on supplies of wood the forest area of all the principal countries of the world is given, with brief mention of the principal timber trees. References to North America are based principally on the reports of Dr. B. E. Fernow (1886) and Prof. Charles S. Sargent (1882). The author draws the conclusions that in spite of substitutes the use of wood increases with advancing population and civilization; that there is still in many lands much waste and but little thought for the future, and that although a dearth of timber may be far distant a considerable enhancement in the price of the commoner kinds may be expected.

Part II, "Woods of Commerce, Their Sources, Characters, and Uses," is by far the most valuable part of the book. The description of each species is necessarily very brief and incomplete, but nevertheless a collection of such data for the whole world has considerable value and is of practical use for handy reference.

Home Floriculture. By EBEN E. REXFORD. Pp. 300. Fully illustrated by drawings and Photographs. Published by the Orange Judd Company, New York and Chicago. Price \$1.00.

This book is a familiar guide to the treatment of ornamental and flowering plants for the house and garden. Mr. Rexford has long been an authority on floriculture for the amateur, using that word in its true original sense, one who does a thing for the love of it. He frankly says that one who does not love flowers and who does not have a certain "knack" with them cannot succeed. But for one who will give care and thought to the window garden or an outdoor one, this book will prove helpful and instructive. There are special chapters on various phases of home floriculture, and full descriptions of the most valuable plants, with attention to their needs, treatment, and the vanquishing of their enemies.

Coupled with the painstaking details of the text, so that no one need go wrong if directions are heeded, there is also a charming literary style, often wanting in works of this nature, and an enthusiasm for the subject, which puts the reader in full sympathy with the author and strikes a bond of friendship at once. While it is so written that it may be read through with pleasure at one time, its value increases from its qualities as a ready reference on any question of home gardening which may arise, a carefully prepared and exhaustive index adding much to its worth. It is the best contribution which has been made to the literature for the amateur florist for many years.

Our Northern Shrubs. By HARRIET L. KEELER. Pp. 521. Illustrated by 205 full-page halftones from photos and 35 pen-and-ink drawings. Chas. Scribner's Sons, New York. Price, \$2 net (postage, 16 cents).

"Our Northern Shrubs" is planned upon the same lines as the author's deservedly pop-

ular volume, "Our Native Trees." It describes the shrubs which are native to the region extending from the Atlantic Ocean to the Mississippi River and from Canada to the northern boundaries of our Southern States. In addition, many foreign shrubs that have been grown here for years are noted.

The arrangement of shrubs is by families, each member being given both a popular and a scientific description. Amateur botanists and nature-lovers will find it a handy guide for the identification of our many shrubs, and through it will be able to learn accurately their habits and characteristics.

The arrangement of the text in this volume is exceptionally good. There is at the beginning a division by genera and species of all the shrubs described. Following is a detailed description of each species, in most cases accompanied by an appropriate illustration. At the end of the volume a glossary of botanical terms and an index of Latin names add much to its value.

In "Our Northern Shrubs" Miss Keeler has written a book that will likely do much to popularize the study of shrubs, just as in her earlier volume, "Our Native Trees," she aroused increased interest in the trees of the United States.

Recent issues of the general magazines contain articles of interest on forestry and kindred subjects. The charm of out-of-doors is more and more finding a place in the civilization of the present day, and the current literature gives abundant expression of that charm. *Scribner's* for June has an entertaining article, illustrated by wonderful photographs, entitled "A New Playground in the New World." This describes the beauties of the Selkirks or Canadian Rockies, in the region around Banff and Mt. Stephen. Another keenly appreciative article in the same magazine is "The Lover of Trees in Italy." *The World's Work's* June issue is, paradoxically, devoted to "the world at play," and practically the entire table of contents is given up to vacations, fishing, camping, hunting, boating, mountaineering, etc. *Outing* takes one out of doors, and *Country Life*, in its June issue, by means of almost perfect illustrations, gives enchanting pictures of rural life.

PUBLISHER'S NOTES.

The advertisement of Camp Algonquin, a summer camp for boys, will be found on another page of *FORESTRY AND IRRIGATION*. This camp is under the able direction of Mr. Edwin De Merritte, who has made a special study of the needs of boys during a summer outing, and whose experience dates back to 1886, with the founding of the present camp on Asquam Lake, Holderness, N. H. Here there is opportunity for all sorts of sports under careful supervision, and every provision is made for hearty fun and recreation. Although the wild surroundings of the camp have been in no way sacrificed, the buildings are commodious and comfortable, so that

"roughing" has all of its charms and none of its inconveniences. Mr. De Merritte, as principal of the De Merritte School of Boston, has had much success in the training of boys, and if it is desirable, arrangements can be made for tuition during the summer, although it is understood that the object of the camp is

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The Marble Safety Axe Company, Gladstone, Mich., makes many other woodsman's and sportsman's novelties beside the safety axe on which the name and reputation of the firm has been founded. All of their specialties equal the axe in workmanship, and the firm lives up to its guarantee to replace any article not strictly up to the highest standard of excellence of its kind. Marble products are not "cheap" in mere dollars and cents, because they are hand-made and only from the best material obtainable, but they are thoroughly dependable, and there are cases when comfort, safety, and even life itself might depend on them.

The Pacific coast, under the impetus of growing Oriental trade and the development of interior resources, is making giant strides in modern industries. For a long time the coast cities and settlements were a shell of civilization around an empty back-country, and existed, in a great measure, on their connection with the eastern United States. Lately, however, development has been consistent and rapid. Resources are being exploited, manufacturing plants established, and all industries stimulated. In this development the northern part of the coast, particularly in the neighborhood of Seattle, has made exceptional progress. This is due in a great measure to the development of the coal resources, supplying a need which the Pacific states have recognized for a long time. The Consolidated Coal Company of Seattle, Wash., owns a developed mine and has other properties of value. This company has for sale certain shares of its capital stock, which are advertised on another page of this magazine. The managers are conducting the affairs of the company on a conservative and business-like basis, and any one interested in an investment which promises to be dividend-paying within a year should address the Consolidated Coal Company, Pacific Block, Seattle, Wash., for prospectus and particulars.

The Kinstler War Bag, advertised in FORESTRY AND IRRIGATION, is a unique device for campers, hunters, or travelers, being so arranged that it can be carried in many ways, either as satchel, pack, or knapsack. Also it has the property of being adjustable to almost any size and makes a neat and compact package under any circumstances. Complete information regarding this device may be obtained by addressing to J. Kinstler, 126 Oak St., Chicago, Ill., a request for Circular "D."

The University of the South, whose advertisement appears on another page, announces its summer courses in law for 1903, sessions to be held at Sewanee, Tenn., from July 2 to September 23, making a three months continuous session.

The summer law course coincides with the

regular summer term of the university, when all other departments are in regular session. Law students are admitted to any of the other courses without extra charge.

The law courses proper include elementary law, pleadings, contracts, torts, crimes, equity, evidence, insurance, personal property, and damages. Classes are so arranged that a wide range of subjects may be taken, which will prove advantageous to beginners, those who are studying for bar examinations, or for those who are already admitted to practice.

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The American Plant and Seed Company of Nashville, Tenn., makes a specialty of grafted nut trees in general and of pecans in particular. They have prepared an interesting booklet, which will be sent free on application, telling of the success to be attained from the planting of nut trees. In it the company makes the point that grafted or budded nut trees will come into bearing as soon as fruit trees will and for a longer period of years will be a source of income. In many cases the trees are highly ornamental and are recommended for planting as shade trees, thus serving a double purpose.

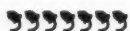
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WE make no charge until your property is disposed of. When the transaction is accomplished we expect only a small brokerage fee—and that only when we have been instrumental in making the sale.

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PROPERTY for sale needs, for the most part, only the intelligent presentation of its salient points to the prospective buyer. We can find that buyer through the interests we touch by means of this magazine.

FREE is the keynote of this offer. We have no "money back if not satisfied" clause, because we do not charge for listing or advertising property. Our aim is simply to bring buyer and seller together to mutual advantage.

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FOR SALE.—A country place at Lewisburg, Union county, Penna. Adjoins on south the campus of Bucknell University, a natural grove of 27 acres. Thirteen-room brick house, in good repair; barn for horse and cow; fourteen acres of ground, four in fruit and garden, overlooking the valley of the Susquehanna for 60 miles; seven counties visible from front porch; scenery equal to any on the Hudson; climate that of central Pennsylvania; no malaria; home sheltered from winds; many conveniences; free delivery of mail, mountain water in the house, gas, electricity. Seven churches in town. Educational advantages unsurpassed; Bucknell University (co-educational) has 624 students and is growing rapidly; students can do two years of professional work. Academy and seminary for pupils too young for college. **Price, \$12,000.**

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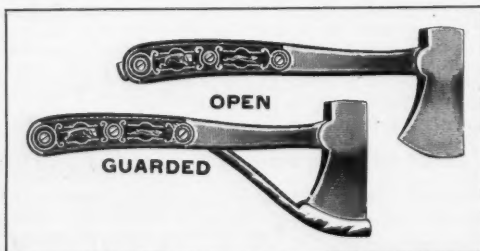
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